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# Park and Ride Feasibility Analysis for the Evansville, Indiana, Metropolitan Area

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# PARK AND RIDE FEASIBILITY ANALYSIS FOR THE EVANSVILLE, INDIANA, METROPOLITAN AREA

A Thesis Presented to  
The Faculty of the Department of Geography and Geology  
Western Kentucky University  
Bowling Green, Kentucky

In Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Geoscience

By  
Brian R. Howard

May 2001

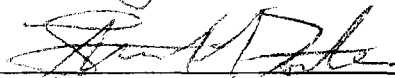
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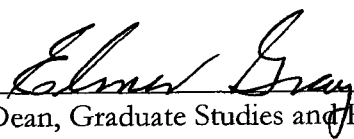


Director of Thesis



Mary Catherine Plante





5/22/01

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Date

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# PARK AND RIDE FEASIBILITY ANALYSIS FOR THE EVANSVILLE, INDIANA, METROPOLITAN AREA

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May 2001

Pages 71

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Congested roadways and declining air quality standards are major concerns for many communities faced with the challenges of suburban growth and city decay. How each community chooses to fight the problems created by urban sprawl depends greatly on individualized characteristics of the community. Analyzing and understanding unique values of each community provides a sound foundation for measures designed to promote sustainable growth initiatives.

The Evansville, Indiana, region is experiencing many of the growing pains associated with increased residential, commercial, and industrial development. Many roadways are currently strained near capacity, and traffic problems are anticipated to increase over the next 20 years. Evansville was ranked 68 out of the 271 worst sprawling MPOs, and Vanderburgh County will be designated as “non-attainment” with the next EPA air quality ruling.

This research demonstrates that the Evansville region has problems with urban sprawl, air quality, and roadway congestion. Local air quality data, roadway congestion, employer and employee surveys, and commute patterns are all analyzed to determine the existing characteristics of the community. As a means to mitigate current and future concerns, Travel Demand Management (TDM) strategies such as park and ride facilities should be utilized. Implementing shared used park and ride facilities will provide an effective and relatively inexpensive method of congestion reduction by providing motorists with a different commute option.

## INTRODUCTION

Transportation is an integral part of life and shapes how humans interact, explore, and move across the landscape. Each and every day, people around the world use some form of transportation to do almost everything. Transportation modes vary by country, by culture and by age. In more developed countries, the automobile or train are typically the chosen form of transportation while in more developing countries, walking or animal transportation may be utilized. Modes of transportation range from walking, to boats and bicycles, to airplanes used for transcontinental flights. Transportation is fundamental to societal accessibility and mobility, even though it is taken for granted by many people.

Transportation is the foundation for the development of a global society. Today it is possible to travel to three cities in different countries on three consecutive days because of advancements in transportation infrastructure and technology. It is also possible to plow hundreds of acres of farmland in one day, with the use of new machinery that once took weeks to do with conventional animal-drawn plows. The ability to optimize transportation resources has created a global infrastructure that enables us to be more accessible and mobile than ever before. More technologically advanced countries have developed intricate networks of interstate highways and high-speed rail along with air and sea travel, while developing countries often depend on a more basic means of transportation. But no matter what mode is used, transportation is still a driving force behind development and interaction.

In the United States, the contemporary built environment has become a landscape established for and by the automobile. Since around the end of World War II, the United States has experienced significant suburban growth. As the automobile became cheaper and more readily available people no longer had to live close to work, which led to the diffusion of people into less densely developed areas surrounding already established cities. Americans were free to

pursue the American dream of owning a house with some land and an automobile.

Unfortunately the American dream has also lead to the congestion of roadways, to increased air, noise and water pollution, to the decentralization of cities resulting in the death of most downtowns or city centers, to poor public transit for those remaining in the city, to an increased strain on roadway and utility infrastructure, and to the ever-increasing problem of urban sprawl.

Before the popularity and availability of the automobile, cities were developed with narrow grid-pattern streets, small lots, compact centers, comprehensive public transit systems, and centralized functions such as shopping, eating, banking, and recreation. Today, suburban developments are characterized by wider streets, larger lot sizes, decentralized activity centers, and less mixed-use development. Neighborhoods often are sterile because of cookie-cutter housing developments with little or no commercial activity. Walking and cycling are not encouraged because the automobile is required to make most trips, which often leads to less interaction between residents and reduced neighborhood pride.

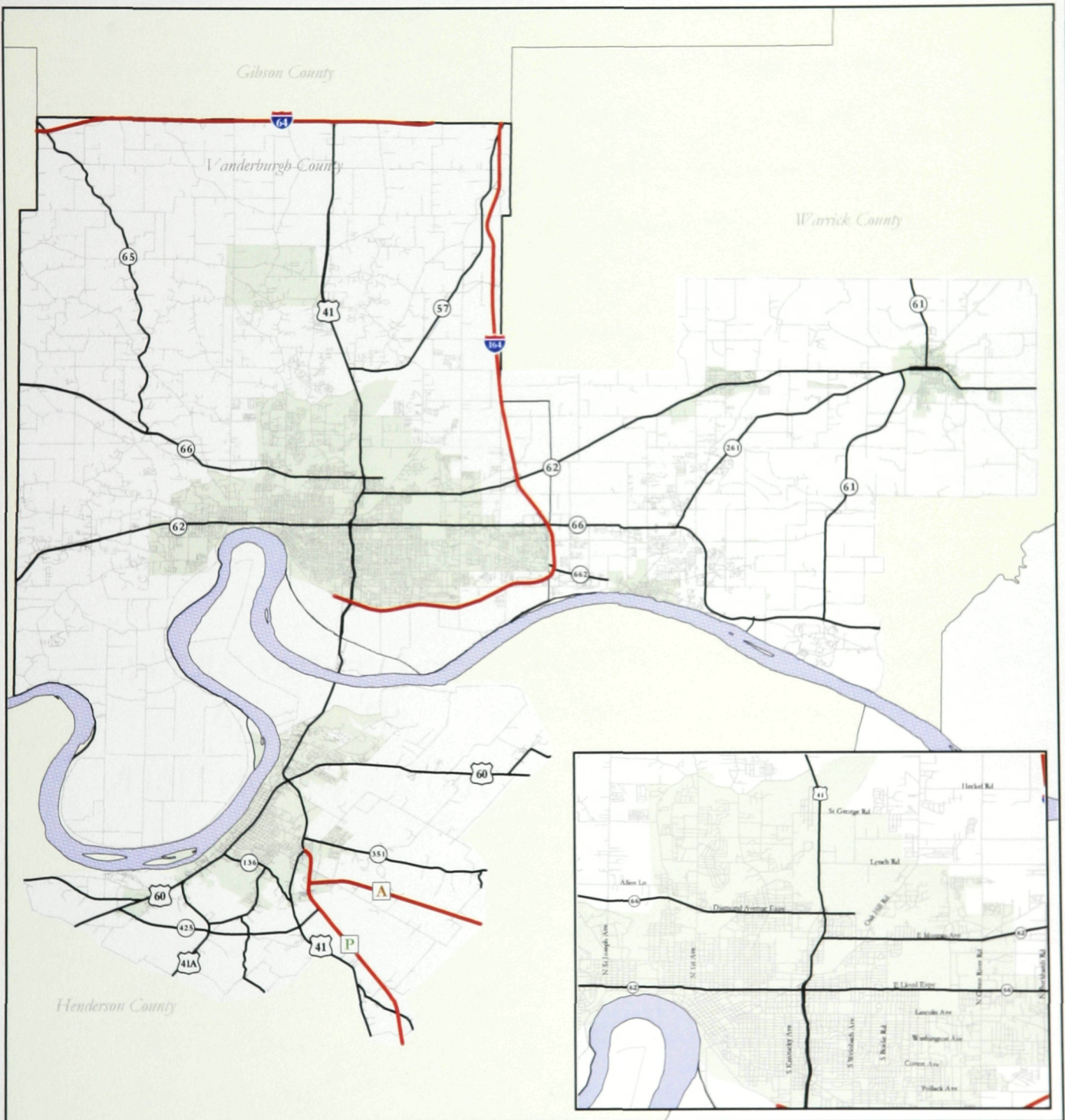
Evansville, Indiana, faces many of the problems outlined above. The downtown activity of the city is essentially limited to government offices, bank offices, law offices, and a few restaurants. Retail activity in the center has all but disappeared. Population in the city has actually declined over the past years, while the county population continues to grow. Roads have become congested with people traveling daily from their home in the county to work in the city. Evansville also serves as the regional hub for business and commercial activities, which also contributes to city congestion. Air quality has declined and the county will be classified as a “non-attainment” area when the new air-quality standards are implemented next in 2002. The adjacent counties of Warrick and Posey, along with Henderson County, Kentucky, will also be considered “non-attainment” areas. When this designation is assigned, improvements must be made to the overall air quality of each county or sanctions may be placed upon the county,

including reduced or loss of federal transportation funds. Before such action is taken, it should be the goal of the region as a whole to improve the air quality and to minimize roadway congestion by combating the urban sprawl that has become a danger to the region.

Implementing a park and ride or carpooling program with increased public transit use, along with increased education of the public about their benefits, would be a relatively easy yet effective way to address some of the planning and transportation problems of the region. A park and ride system could be implemented at nominal expense to the local governing bodies with the development of shared-use facilities. A shared-use park and ride facility could take advantage of existing parking spaces available at shopping centers, businesses or churches along major corridors to provide a central location for motorists to meet and form carpools. Funding for the signs and public education programs are available in the form of Congestion Mitigation and Air Quality (CMAQ) grants that require only a 20 percent match from local jurisdictions to the overall cost. Park and ride or carpooling is a theoretical and practical solution to current congestion and air quality problems facing the entire Evansville region. As a form of Travel Demand Management (TDM), shared-use programs have proven themselves as valuable solutions to air quality and congestion problems.

The purpose of this thesis is to examine current transportation trends within the Evansville Urban Transportation Study (EUTS) Study Area (see Figure 1) and to determine how a system of park and ride or park and pool facilities would benefit the community by reducing daily vehicle miles traveled. A review of literature, along with current data and local business surveys, provides the foundation for analyzing the possible need for park and ride facilities. Included in the study is an evaluation of possible funding sources, locations, and policy recommendations.

# Figure 1 - EUTS Designated Study Area



2 0 2 Kilometers

2 0 2 Miles



- Local Roads
- State Roads
- Interstate/Parkway
- City Boundary
- County Boundary
- Major Rivers

## BACKGROUND

Planning policy has experienced many changes since its conception in the early 1900s. Early planners adapted concepts from sociological perceptions to establish the city as a sociological framework capable of being studied and analyzed. Robert E. Park and Ernest W. Burgess were two early sociologists who focused their attention during the 1920s and 1930s on the belief that human ecology was based upon, and determined by, the built landscape (Mohl 1998). Much of the research conducted under the Chicago School of thought during this period focused on localized studies of groups and interaction and was often linked to land use patterns while little if any regional analysis was incorporated (Mohl 1998).

During the same period, other groups were more focused on regional planning schemes. The Regional Planning Association of America (RPAA), spearheaded by Clarence Stein and Lewis Mumford, began to observe the automobile's early impact on the decentralization of cities. Stein and Mumford believed that the planned city, much like the Garden City concept of Ebenezer Howard, was the most appropriate way to plan communities on a regional basis. Mumford felt that properly planned communities could establish a regional relationship with its hinterland that would transcend political boundaries (Mohl 1998). After much debate and study, the RPAA's concept of "planned regional cities and controlled decentralization was, ultimately, utopian and impractical" (Mohl 1998, p. 5).

With the rise of automobile use and the increased decentralization of urban populations during the post-World-War II era, transportation planning took on a completely new approach. The U.S. victory in World-War II and the resulting economic boom lead to an explosion of growth and development not before seen in the United States. The process of suburbanization led to the development of residential, commercial, and industrial development around the periphery of established urban centers. The sudden growth of suburban communities became



too demanding for existing infrastructure. To combat this trend, regional planning agencies were created to improve existing infrastructure (NJTPA 1996).

By the 1960s, it became apparent that regional organizations were needed to promote cohesive planning in metropolitan areas. In 1962, the Federal-Aid Highway Act created the foundation for metropolitan planning organizations. This Act required all urbanized areas over 50,000 in population to establish a “3-C” (continuing, cooperative, and comprehensive) planning process in order to receive federal highway planning and improvement funding (EUTS 1998). This mandate was due in part to the 1956 Federal Highway Defense Act, which established the provision for construction of the interstate highway system. The Federal Highway Defense Act signed by President Dwight D. Eisenhower in 1956 allocated funds for 42,800 miles of interstate highways (Jacobson 1996). According to Jacobson (1996, p. 20) "Richard Weingroff, a historian at the Federal Highway Administration, notes that President Eisenhower made it clear that transportation and economic growth were his primary reasons for supporting the interstate highway system." In the proposal, states would pay only ten percent of the cost of construction. Although additions are still being made to the transportation network, the interstate system is considered essentially to be complete. The total cost for the entire system, approximately \$130 billion, is high, but it has made the United States one of the most connected and mobile societies in the world (Jacobson 1996).

In order to receive federal funding for road projects, “by July 1965, all the 224 existing urbanized areas had an urban transportation planning process underway” (AMPO 2001). However, transportation planning was lacking in many urban communities. The Bureau of Public Roads (later forming the Federal Highway Administration) required that communities create agencies that would implement the necessary planning process. Therefore, Metropolitan Planning Organizations were formed to manage the growth and planning process (USDOT



1988). Many of the first MPOs were part of regional planning councils that were responsible for carrying out various planning tasks (NJTPA 1996).

Urban transportation began to flourish in the late 1960s and 1970s. The “3-C” planning process was the foundation for all planning activities and by 1968 “most urbanized areas had completed or were well along in their 3-C planning process” (AMPO 2001, p. 2). Major emphasis was placed on creating a planning process that would create a sustainable planning environment for local communities. During the 1970s, short-range plans became important to combat the growing congestion on roadways and concerns over environmental issues.

The mindset of the nation switched in the 1980s to incorporate less government intrusion into local efforts, including the transportation planning process. The Federal Highway planning regulations were reevaluated, and portions were removed that were not specifically covered under statute. New planning requirements were established including requirements for a transportation plan, transportation improvement program (TIP), and a unified work program for urban areas with a population greater than 200,000. These new requirements granted to the state and local agencies more power of approval and implementation of projects that were completed.

Current transportation planning practice is driven by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which was signed into law on December 18, 1991, and TEA-21, ISTEA’s successor, signed into law on June 9, 1998. The TEA-21 (Transportation Equity Act for the 21<sup>st</sup> Century) program continues many of the established programs of ISTEA, while incorporating new initiatives to improve safety, enhance and protect communities, protect the natural environment, and advance America’s economic growth and prosperity. TEA-21 promotes guaranteed federal funding levels, flexible funding program initiatives, and continued transportation technology research (EUTS 2000).

Through transportation initiatives in the United States and in countries throughout the world, transportation has become a key push-pull factor in the ever-changing global economy. Globalization is a process that is driving the development of many countries and forcing national and local governments to reevaluate current procedures in order to compete in the global marketplace. The phrase ‘think globally, act locally’ is now more important than ever (Warburton 1998). With the accessibility and mobility available today, local and global communities are more connected than ever. Not only has international trade increased through globalization but international communication and investment have increased as well (Nijkamp et al. 2000). All of these factors make transportation nodes prone to improved development potential due to their strategic location.

Although transportation is a major component of the linkages between the local and global economy, it also has some weaknesses. Transportation, especially the use of the automobile, is considered to be a major contributor to air pollution at the local level and to the process of global warming on a much larger scale (Nijkamp et al 2000). Transportation activities also drain the global supplies of important natural resources such as oil. The role of transportation in the decentralization and suburbanization of American cities has led to other problems such as “crime, insufficient tax bases, racial tension, poverty, poor schools, and poor public services” (Ding and Bingham 2000, p. 837). It is therefore important to evaluate current transportation practices on a local, regional, national, and global level in order to mitigate harsh environmental impacts while maintaining adequate accessibility and mobility.

Government-based initiatives are one way to combat the problems created by urban sprawl and congested roadways. Some communities have reevaluated the role of new transportation infrastructure and the overall benefit, positive or negative, of new expenditures. For example Gary Baeten (2000) examined the Flemish government’s decision not to construct a

highway that had been in transportation plans since the 1970s that would connect two smaller towns near the French border. Supporters of the new highway contend that the new access would provide a more direct route for citizens to the Channel Tunnel and other major cities in Europe and would serve as a major economic boost for all communities involved. However, others argued that the new highway would take away valuable farmland, lead to more traffic, unsafe roads, more pollution, and increase noise levels that would harm the quality of life in their neighborhoods (Baeten 2000).

Part of the reason the government chose not to build the road in this case study had to do with environmental concerns; however, another part was the fact that other cities and neighborhoods along the route would face a disproportionate amount of the negative impact. A parallel example would be the impact of the interstate highway system in the United States on inner-city communities. Interstates often were built where land was the cheapest and through areas where the residents had the least amount of political influence. Often, African-American communities along with other minority groups suffered the negative impact of the interstate. Communities were cut off from each other by a freeway running through the middle of the neighborhood. The interstate enabled those with money and power to move farther away from the city and still maintain the same lifestyle, while those with the least amount of money were forced to maintain residences in areas that had suffered the harshest impact of the new roadway. A result was impacted ghettos and disenfranchised communities, which has led to the spatial concentration of poverty and declining inner-city neighborhoods.

Research has shown that “blacks, lower-income groups, and working-class persons are subjected to a disproportionately large amount of pollution and other environmental stressors in their neighborhoods” (Baeten 2000, p. 73). However, rules are in place today that help reduce or eliminate this outcome in the United States. All MPOs must include a section in their

planning guidelines outlining an Environmental Justice practice that will guide transportation planning activities. Any new project must analyze the potential impact on minority groups. No longer is the practice of building in the cheapest or weakest neighborhood tolerated, although problems do still occur in the planning process.

To prevent sprawling suburban development strangling the city center, governments and planners in Portland, Oregon, and Curitiba, Brazil, took innovative steps to ensure the vitality of their cities. Beginning in the 1970s, both cities took what seemed to many as drastic measures to focus planning efforts on maintaining a cohesive city. The results of these proactive initiatives have proven that with proper controlled development, cities can maintain their character and livability while still allowing for growth.

In the early 1970s, Curitiba was the fastest growing city in Brazil, but the result of the growth was uncontrolled congestion in the city and air pollution that choked the citizens. Mayor Jaime Lerner, an architect by profession, took the initiative in 1972 to halt the construction of a new overpass that would have demolished the city's historic main street (O'Meara 1998). A pedestrian mall was created along the main corridor and further steps were taken to improve the city. The most fundamentally sound public transportation system in the world was developed to transport residents around the city. Buses used by the city were developed to operate like a subway car with wide-opening doors to promote quick entering and exiting of passengers. Mixed-use developments, including residential development initiatives in the city center, were used to increase the urban population and to reduce the increasing boundaries of the city. The results of this process reduced roadway traffic and improved congestion and air quality concerns in the city.

Portland, Oregon, although facing a different problem, took the necessary steps to promote growth within the city and limit outward sprawl. Portland faced rapid suburban flight

in the 1970s. Residential and commercial activity within the city was declining as more and more people moved to suburban areas. In an attempt to prevent further damage to the city from new roadway construction, a group of citizens appealed to Mayor Neil Goldschmidt for action. Planners developed a plan that established a growth boundary around the city, discouraging the effects of sprawl. Money once focused on the construction of new roadway infrastructure was used to develop a light rail and bus network within the city to improve accessibility and mobility of city residents. No new highway facilities were constructed; the city demolished the freeway running along the riverfront and replaced it with a park (O'Meara 1998).

Both cities through innovative measures have managed to maintain vibrant central cities. The cities are compact, largely due to the increased public transit ridership that actually grew more quickly than the urban population. The urban population grew while reducing air pollution and promoting additional green space and parks (O'Meara 1998). The population of "Portland has grown by almost 50 percent since 1975, [while] the urbanized area has expanded by only 2 percent" (O'Meara 1998, p. 11). These figures indicate that the growth restrictions placed on the city did manage to prevent sprawl yet still allowed the city to flourish. The same cannot be said for Chicago and Cleveland, however. From 1970 to 1990, the population in Chicago grew by only four percent, yet it consumed 46 percent more land. The population of Cleveland declined by 11 percent, although the urban land uses increased by 33 percent (O'Meara 1998). While other cities have been sprawling out of control, creating more congestion, and forcing governments to develop expensive infrastructure, cities such as Portland and Curitiba have managed to maintain their original, historic character while still managing to grow.

In order to develop a sustainable approach to planning, the current needs of the community must be met but the future implications should be addressed to provide future

generations with the ability to make choices. It has often been stated that we are not owners of the Earth. The world as a community is just currently occupying the space (Baeten 2000).

A current trend in planning that takes into consideration current needs and future implications is a sustainable development approach. The term sustainable development “was coined in 1980 by the International Union for the Conservation of Nature in its report World Conservation Strategy” (Baeten 2000, p. 70). The land-use planning approach to sustainable development includes minimal expansion of development areas, infill of development in concentrated urban environments, and comprehensive and functional zoning regulations. Cities are the main consumers of natural resources, food, energy, and space, while they contribute the most to pollution and waste (Nijkamp and Pepping 1998). From a transportation perspective, sustainable development is movement to a more efficient form of travel demand. Environmentally friendly modes of travel such as bicycles or walking are key, but they also include the utilization of high-occupancy vehicle travel and public transit use (Marshall 2000). Focus is also placed on the future reduction of trips by improved linkages between land-use and transportation-planning policy.

The European Commission (EC) established guidelines in 1992 that outlined a sustainability approach to planning. The policy states the following as criteria for guidance (Baeten 2000):

- ♦ Spatial planning to reduce transport demand and create opportunities for alternative transport modes
- ♦ Construction of new infrastructure
- ♦ Improvements in public transport
- ♦ Technical improvements to cars and fuels
- ♦ Measures to induce changes in travel behavior

This planning policy also endorses the concept of congestion pricing, where the polluter is responsible for paying the impact he or she creates on the environment. This concept means that the price of transportation facilities should include the hidden costs such as pollution and congestion.

A combination of land-use and transportation policies must be utilized to enable sustainable development to work. Locating high-density land-uses in proximity to adequate and multimodal transportation facilities is important to allow people to have freedom of choice. Mixed-use developments are often popular where commercial, residential, and work centers are all located within an overall development plan that provides linkages between all. Urban concentrations, along with adequate public transit facilities, are important to ensure residents living in concentrated urban areas have the ability to move about the built landscape without the necessity of an automobile. When origin and destination points are close, more options are available for travel mode and travel efficiency is increased (Marshall 2000). Without a community concept or development strategy, the cooperation between land use and transportation cannot be achieved. The transportation network strives to allow access while maintaining an efficient flow of traffic. However, without proper land-use guidelines, the efficient and sustainable interaction between development and transportation will be hindered.

A sustainable approach to planning cannot occur overnight. In the interim, policies incorporating Travel Demand Management (TDM) strategies are a good way to improve traffic flow and improve the environment. One of the most common forms of TDM strategies utilized in communities to reduce vehicular trips is the implementation of a park and ride or carpool network. The concept has been around for a long time and is has proven to be effective.

In order to understand the concept and application of park and ride programs today, it is important to have a historical perspective on the development of park and ride programs.

Park and ride is not a new concept in the United States. The use of park and ride lots first began in Detroit over 70 years ago (Turnbull 1995). Commuters began parking in service-station lots, forming the first informal park and ride facilities. The city operated eight park and ride facilities located adjacent to major transit routes (Levinson et al. 1973). In 1939, the first facility developed for use during special events was established for the World's Fair in New York City and is still in operation today (Turnbull 1995). "Fringe lots," as they were initially called, were developed along the Long Island Railroad to help commuters reach the World's Fair (Stutts 1989).

During the 1940s, the utilization of park and ride lots diffused slowly across the United States. Transit authorities in cities such as Cleveland, Boston, St. Louis, Philadelphia and Atlanta began operating "fringe lots" along mass transit lines (Turnbull 1995). Communities also experienced the first carpool matching assistance programs during World War II. Carpooling was not mandated but rather encouraged to assist in the war effort. Reduced use of gasoline and tire rationing were the driving factors behind this matching program (FTA 1999).

By the 1950s, cities began developing park and ride lots on a much larger scale. A 1,000-space lot was developed in Forest Park, a suburb of St. Louis, in 1953 and an 1,800-space parking facility was constructed by the Port Authority of New York and New Jersey in 1955 (Turnbull 1995). The 1,800-space facility marked the first major involvement of local government in the development of park and ride facilities.

The trend of park and ride lots was well established by the 1960s. Both private and public transit operators viewed the park and ride facilities as a viable alternative to the operation of automobiles (Turnbull 1995). Within the decade, approximately 36 cities indicated that some form of park and ride facilities were in operation. Park and ride facility popularity increased even more in the 1970s with the worldwide energy crisis (Turnbull 1995).



The 1970s also saw “the first joint urban transportation planning regulations issued by FHWA [Federal Highway Administration] and UMTA [Urban Mass Transportation Authority], which became effective in 1975” (Turnbull 1995, p. 7). This legislation required that “metropolitan planning organizations (MPOs) develop transportation plans that included both a long-range element and a short-range transportation systems management (TSM) element” (Turnbull 1995, p. 7). TSM projects focused on low-cost or no-cost enhancements to the efficiency of the transportation network.

Throughout the 1980s and 1990s, park and ride facilities have been viewed as a positive alternative to single-occupancy vehicle travel. The late 1980s and early 1990s saw the development of many dedicated park and ride facilities, although the concept of shared-use facilities was not common. An existing road right-of-way was often used to construct a lot for use as a park and ride facility only. However, the cost of construction and subsequent lack of use in some cases has led to the development of shared park and ride facilities. Today, existing shopping center parking lots, church lots, and vacant development lots are often used for park and ride facilities. These lots allow previously unused parking spaces to be utilized as a park and ride lot, while the local business has the opportunity to attract pre- or post-work shopping by park and ride users.

## **ANALYSIS**

### **TRANSPORTATION PLANNING**

Transportation Planning is an essential part of sound community growth. Current and future planning activities provide guidance for development and prosperity while maintaining a roadway network capable of accommodating the necessary traffic. Transportation planning, especially in a MPO area, should incorporate multimodal transportation solutions.

Incorporating commuter rail, bus or other public transit, bicycle and pedestrian forms of transportation allow commuters a choice of mode based upon need. A multimodal approach can promote various forms of travel while maintaining or improving the safety, accessibility and efficiency of the transportation network.

The goal of transportation planning is not to dictate the exact location of roadways, but rather to guide future needs and implementation based upon roadway capacity (Shamburger 1999). Although not an exact science, transportation planning often incorporates the scientific model into the decision-making process. When focusing on a transportation planning issue, it is important to identify the problem at hand. Second, goals should be established that incorporate alternatives that may be used to achieve the end result of the goals. Next, data collection and analysis of possible solutions are examined and the most efficient and effective alternative is chosen. Finally, the chosen alternative is implemented as policy (Khisty and Leleur 1997). A vital step in the transportation planning process is the evaluation of all possible means to achieve the desired result. The only way to determine the best solution is through data gathering and analysis. This modified scientific method allows all alternatives to be evaluated.

Using a quantitative approach to the planning process, as characterized by the modified scientific method, allows planners to determine the best desired result. However, transportation planning must cope with an ever-changing environment, which does not lend itself easily to

model answers. Therefore, it is important that planners also examine the real-world factors that influence plan implementation. Probably the most influential of these is politics. An underlying force driving planning that planners must take into consideration is that “planning takes place in a political environment, and that ultimately, all plans are really political statements” (Khisty and Leleur 1997, p. 19). Political influence on planning issues may come from local, regional, state, or national agencies wishing to implement strategies that best meet their desired goals.

Transportation planners are also forced to develop plans that are appropriate for two competing functions. Roadways are constructed to allow equal access and mobility for all users, while providing access to local developments (Shamburger 1999). Roadways provide ingress and egress from local properties, which in turn impede traffic flow on the adjacent transportation network. Driveways along a roadway increase the number of conflict points that a driver must continually monitor for entering and exiting traffic and therefore decrease the free flow speed of the roadway. Transportation planners should attempt to keep the two service functions of the roadway separate.

Basic guidelines have been established to rank roadways from an intensity standpoint to help determine appropriate access locations. Roadway classification serves to define the primary purpose of a specific roadway. For instance, the principal function of a major arterial is for traffic movement, while local roads primarily serve to provide access to abutting properties.

Outlined below are the functional definitions of the various roadway types (EUTS 2001):

<b>Freeway</b>	Primarily divided highways providing the highest level of service; full access control utilizing ramps or interchanges; maximum speed limit is usually permitted and the largest traffic volumes experienced.
<b>Principal Arterial</b>	High volume corridors that serve major activity centers as part of an interconnected network of continuous routes between the central business districts and fringe areas; the primary purpose is to provide safe and efficient service for major traffic movements where property access is subordinate.

<b>Minor Arterial</b>	Interconnect and augment the principal arterials; distribute traffic to geographic areas smaller than those served by the principal arterials with more emphasis placed on property access.
<b>Collector</b>	Provide property access as well as vehicular travel within residential neighborhoods, commercial and industrial areas; disperse traffic from arterials to ultimate destinations; collect traffic from local streets, connecting them to the arterials.
<b>Local</b>	All streets not classified in a higher system; provide direct access to abutting property and higher classifications of the roadway system; has the lowest level of mobility with little or no service to through traffic.

As shown by the functional classifications, local and collector roadways should be utilized by local traffic for access to individual properties. Arterial and freeway roadways should be very limited in access points and be constructed to distribute traffic quickly and efficiently.

Transportation planners are charged with creating a safe and efficient transportation network that accounts for the health, safety, and welfare of the community, while providing sufficient access for developments to promote growth. Government officials are responsible for the implementation and adoption of plans; however, transportation planners often work as technical advisors for plan implementation which governments officially rely on for advice and direction. The role of the transportation planner is constantly changing. Planners must be aware of current trends and past practices to serve best the community as a whole.

## **URBAN SPRAWL**

Urban sprawl has become an issue of major importance for many communities throughout the United States. Communities today are faced with the expansion of the suburban landscape further and further away from the city center. Not only does the expansion place more strain on the transportation network by creating additional congestion and increasing delay, but communities are also forced to extend expensive infrastructure to accommodate the

growth. New roadways must be constructed, utilities must be extended, additional fire and police protection are needed, and more schools must be built. Is urban sprawl a problem for US cities? Many communities think so.

In November 1998, voters in communities throughout the United States voted to pass approximately “two-thirds of 240 ballot initiatives to preserve open space or otherwise reshape development” (Carey 1999, p. 110). By 2000, the number of ballots containing some form of growth measure grew to 553 in 38 states. The Brookings Institution Center on Urban and Metropolitan Policy, which released the information, indicated that over 70 percent of the measures were approved (El Nasser and Overberg 2001). The Pew Center for Civic Journalism, a non-profit organization, asked voters to express their most important concerns within their communities. The results of the survey listed “sprawl and traffic tied for first with crime and violence” (El Nasser and Overberg 2001). Both were tied in first place by 18 percent of the people surveyed, while issues such as education, health, and medicine were much less important to voters.

Many Americans have the perception that urban sprawl is a disease expanding to the point where all land is infected. Carey (1999, p. 110) points out that approximately “1,000 to 3,000 acres of farmland, forest, and other unbuilt-upon land are developed every day.” This untamed growth has forced many communities to take a reactive approach to the planning process instead of a proactive planning approach. When faced with intensive and extensive growth, communities often implement measures that are temporary fixes for the infrastructure instead of developing overall land development strategies which will benefit the community for years to come.

An example provided by Carey (1999) of Loudoun County, Virginia, provides insight to what many communities are facing. Loudoun County has quickly become a suburb of

Washington D.C., much to the chagrin of many county officials. Scott K. York, chairman of the county's Board of Supervisors, says "all of a sudden, people are sitting in traffic jams, with crowded schools and higher taxes and wondering how the hell development is good for them" (Carey 1999, p. 110). Many communities are facing the same fate. Today, 83 percent of metropolitan areas in the United States are sprawling more than in 1990 (El Nasser and Overberg 2001).

Instead of supporting the movement of cities away from the central city, many planners are encouraging controlled development and infill. The concept is simple: in order to keep people from spreading out away from the city, it is necessary to provide people with a reason to live, work, shop and play close together (Carey 1999). The city of Portland, Oregon, in the 1970s became one of the first cities to develop a green space development barrier around the city. Within the 230,000 acre core, infill development is encouraged, while outside, regulations have severely limited development (Carey 1999). The city made an effort to expand the bus and rail networks within the 230,000 acre core in order to accommodate the anticipated growth. Since the 1970s, the city has managed to increase residential population by almost 50 percent, while limiting the area of new development during that time to only 2 percent (Carey 1999).

Five counties in South Florida have developed a much bolder plan to help curb development in undesirable areas. The five counties currently have a population of approximately 5.5 million people and this figure is anticipated to grow to almost 7.5 million by the year 2020 (Carey 1999). Much of the new development is taking place east of the I-95 corridor. Although the land is available, the new development threatens to infringe on the Everglades and is costing the state billions in new road improvements. The counties implemented a program called 'Eastward Ho!' in an attempt to funnel development along the east section of I-95 (Carey 1999).

The goal of many anti-sprawl movements is to “create neighborhoods and downtowns where residents can walk to shopping or catch a streetcar to work” (Carey 1999, p. 111). This concept is a throw back to the pre-1940s American communities. Convincing Americans that these measures are good, however, is another issue. “Americans are accustomed to cheap gas, weak land-use controls, and subsidies for roads” (Carey 1999, p. 111), which makes it hard to change the perceptions of motorists about alternative forms of travel. Often, local government agencies encourage sprawl with ordinances requiring large lots and wide streets. The process of implementing measures to counteract the ever-increasing trend of urban sprawl is difficult at best. Many people agree that US cities face the threat of uncontrolled sprawl, which will inhibit future growth. However, they also do not want to encourage dense developments, which are necessary to encourage infill development within a city core. According to Charles J. Ruma, “Americans hate two things: sprawl and high density” (Carey 1999, p. 111).

To illustrate the growing trend of urban sprawl, El Nasser and Overburg (2001) recently published an article in the USA Today recently published an article outlining the concept of urban sprawl and ranked the 271 US urbanized areas according to a sprawl index. The two major components of the index include current population density of the metropolitan area within its urbanized boundary and the change in population density through the 1990s. Density is defined as the “percentage of a metro area’s population that lives in ‘urbanized areas,’” and the urbanized area is defined by the Census Bureau designation of metro areas with a density of 1,000 or more residents per square mile (El Nasser and Overberg 2001, p. 1A).

The sprawl index includes all 271 cities in the United States that have a population greater than 50,000 people. The USA Today ranking was calculated by adding the ranks of 1999 population and population change from 1990 to 1999 for each of the 271 cities. As an example, “in the Louisville metro area, 76% of the population lived in urbanized areas in 1999. That gave

Louisville a rank of 85 among the 271 metros. In 1990, 79.6% lived in urbanized areas.

Louisville's 4.5% drop during the '90s gave it a rank of 221. Adding those two rankings of 85 and 221 produced a sprawl index score of 306" (El Nasser and Overberg 2001, p. 1A). This ranking method was used to calculate the sprawl index for all 271 metro areas.

The research indicates that smaller urban areas tend to sprawl more significantly than larger metropolitan areas. The majority of the larger metropolitan areas, populations larger than one million, are experiencing the least amount of sprawl. For example, Chicago, New York, Los Angeles, Miami, San Diego, San Francisco/Oakland, and Salt Lake City are all within the 35 least-sprawling metropolitan areas (El Nasser and Overberg 2001). The top five sprawling cities are Ocala, Florida; San Luis Obispo, California; Johnstown, Pennsylvania; Charlottesville, Virginia; and Sumter, South Carolina—none with an urbanized population over 250,000. Part of the reason for the increased sprawl in smaller metropolitan areas is the vacant land available for development and weak zoning ordinances, whereas larger cities often have physical constraints that prohibit further expansion. Physical features and water play a major role in the ability of a community to expand (El Nasser and Overberg 2001, p. 1A).

Table 1 shows the six Indiana cities that rank in the top 75 sprawling cities of the U.S. The Evansville Metropolitan Area has an estimated population of 291,396, according to the research conducted by El Nasser and Overberg (2001). The metropolitan area has approximately 62.90 percent of its residents within the urbanized area and it experienced a growth rate of -4.10 percent during the 1990s. As the research shows, sprawl is an issue which should be taken seriously in the Evansville Metropolitan Area. The population of the urbanized portion of the city has declined by over 4 percent during the 1990s which clearly demonstrates the trend of suburban flight. As Table 1 shows, generally, the higher the reduction in urban population, the higher the sprawl rank.



**TABLE 1: INDIANA CITIES IN THE TOP 75 US SPRAWLING CITIES**

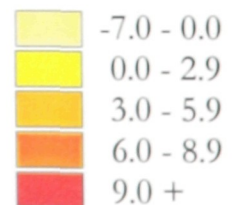
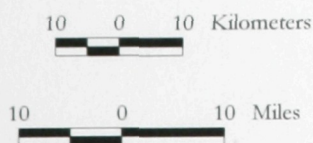
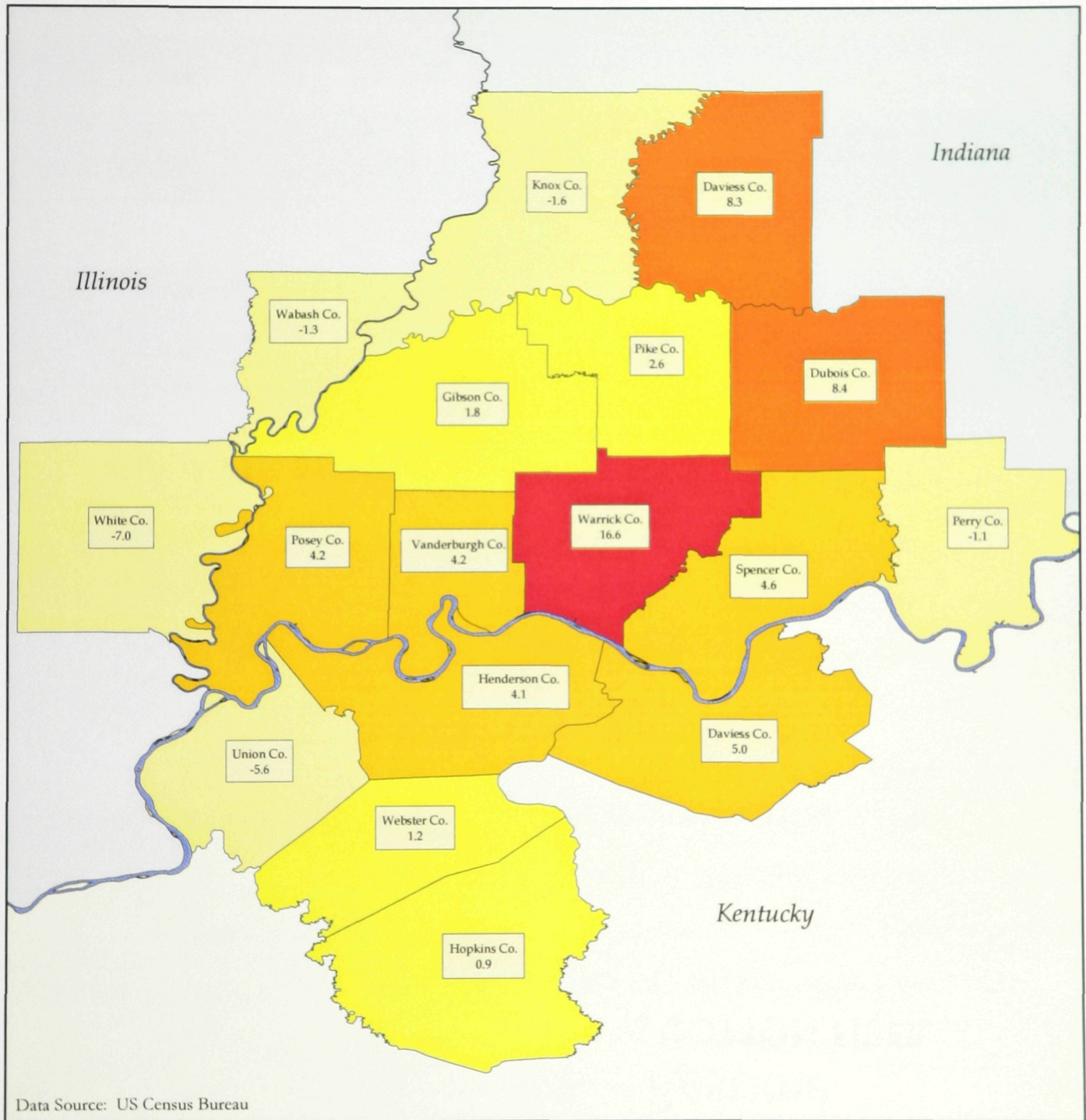
<b>City</b>	<b>Rank</b>	<b>1999 Population</b>	<b>1999 % Urbanized</b>	<b>1990–1999% Change</b>
Terre Haute	8	148,376	53.00%	-5.80%
Fort Wayne	23	483,652	56.30%	-5.30%
Elkhart	52	173,805	60.50%	-4.30%
Lafayette	54	172,920	59.40%	-4.20%
Evansville	68	291,396	62.90%	-4.10%
Kokomo	71	100,114	57.10%	-3.10%

Source: El Nasser and Overberg (2001) USA Today, compiled by the author.

Preliminary 2000 US Census data show that the population in Vanderburgh County (Evansville) has grown by approximately 4.2 percent. Figure 2 shows the population growth of all 17 counties included within this study's regional approach to park and ride feasibility. The overall growth of the region is approximately 2.66 percent, but the growth in Vanderburgh County and the surrounding adjacent counties is much higher. In Warrick County alone, population grew by approximately 16.6 percent during the 1990s. The southwest region of Indiana is growing and it is reasonable to assume that a significant portion of the growth is directly related to the recent development trends within Vanderburgh County.

As this research suggests, uncontrolled growth and sprawl are concerns that all cities should be prepared to handle. The data from the USA Today survey show that sprawl is not isolated to large metropolitan areas. Smaller cities are actually experiencing faster sprawl rates than their larger counterparts. Over the past 10 years, Vanderburgh County has grown by 4.2 percent while the population living within the urbanized area has dropped by 4.1 percent. This percent change clearly indicates a trend of population leaving the existing development within the city and moving to more rural, county areas.

Figure 2 - Percent Change in Population:  
1990 - 2000



## TRANSPORTATION AND AIR QUALITY

The link between transportation and air quality has become a major issue for transportation planners in recent years. As more and more roads are planned and constructed, the prospect of increased traffic volumes on roadways is a very serious concern for local government agencies. It is a necessary step for local planning agencies to incorporate measures that will help reduce vehicle emissions in an attempt to improve air quality.

According to the Environmental Protection Agency (EPA) document *Automobile Emissions: An Overview* (1994), there are several pollutants that are responsible for current air quality concerns within the United States. Hydrocarbons (HC) are produced when fuel molecules do not completely burn within an engine and react with nitrogen oxide to produce ground-level ozone. Nitrogen oxides (NO<sub>x</sub>) also form in an engine from high pressure and temperatures that cause nitrogen and oxygen to react with each other. Nitrogen oxides are also responsible for ground-level ozone formation and acid rain. Carbon monoxide (CO) results when incomplete combustion occurs because carbon in the fuel is not fully oxidized. Carbon monoxide inhibits the flow of oxygen through the bloodstream and is dangerous to persons with heart disease. Carbon dioxide (CO<sub>2</sub>) is a greenhouse gas that does not directly harm human health but it does contribute to the process of global warming.

One mechanism to help combat air quality problems is the implementation of programs and requirements in planning policies that will help reduce emissions within a community. Local agencies should implement programs that strive to “reduce growth in the length and number of motorized journeys, encourage alternative means of travel . . . , and reduce reliance on the private car” (Louth 1997, pp 97-98). However, this task is not an easy one. Most communities in the United States rely heavily on the automobile as the primary mode of travel. Public transit funds are usually nominal compared to roadway construction and improvement funds that only help to

promote automobile travel. Larger communities are typically the only ones with any form of public transit at all. Small to medium cities force citizens to utilize the automobile because of the lack of other forms of transportation. Local planning agencies should promote alternative forms of transportation that will help “reduce emissions of greenhouse gases and air pollution, curb noise pollution, manage traffic congestion, reduce dependence on foreign energy supply, boost the sustainability of our local and regional economies, and enhance community livability” (Replogle 1995, p. 4).

Since the 1970s, many overall improvements to pollution sources have helped reduce the amount of pollution emitted per vehicle, but pollution has continued to increase due to the increase in annual vehicle miles traveled. The introduction and improvement of catalytic converters, increased use of computer monitoring of emissions on automobiles, improved gas qualities, and tighter overall standards have reduced the amount of emission produced by each individual vehicle (EPA 1994). However over this period of time, the number of vehicle miles traveled has more than doubled (EPA 1994). Increased regulations and the increased vehicle miles traveled have, in essence, offset each other. The only pollutant present in 1970 that has experienced significant decrease in emission is lead, which is no longer used in gasoline. Other pollutants have experienced only modest reductions (EPA 1994).

According to 1998 EPA data, “on-road vehicles are major contributors to CO emissions, representing 57 percent of total national CO emissions” (EPA 2000, p. 2-1). An additional 20 percent is created by non-road vehicle engines such as lawn and garden tractors, industrial uses, and recreational boat engines (EPA 2000). In England, transportation vehicles account for approximately 20 percent of CO emissions (Louth 1997). As these figures show, the US has a much higher pollution rate than England due in part to the dependency on automobiles in the US. Automobile use in the United States is also responsible for 31 percent of NO<sub>x</sub> emissions

and 29 percent of Volatile Organic Compound (VOC) emissions. Automobiles contribute the most pollution in the NO<sub>x</sub> category and are second in VOC emissions (EPA 2000). As the data demonstrate, automobile use contributes heavily to annual emissions in the United States.

The problem of air pollution and the detrimental effects it has on the human body and on the environment should be sufficient to initiate programs that will reduce the future impacts. Mexico City, for example, has long been considered one of the most polluted cities in the world. Because much of the country's economic and industrial activity is concentrated within Mexico City, its inhabitants often experience pollution levels that are considered unsafe to human health. In January 1996, when ozone levels in Mexico City "hit 2.5 times the level considered safe, officials banned driving for half the city's cars for two days" (Canada 1996, p. 20). Pollution in the city became so bad that automobiles were banned. Instead of taking such drastic measures and relying on reactive planning, research has shown that "limiting highway capacity expansion, reducing highway capacity, and calming traffic can be effective strategies for reducing energy use, air pollution, and other environmental problems, particularly when done in a context of regional growth management" (Replogle 1995, p. 4). Regional planning policy should make an attempt to connect residents within the region, while attempting to offer a multi-modal approach to transportation planning. It is imperative that transportation plans and policy "ensure that they provide expanded opportunities to meet daily needs for access to jobs, shops, services, and recreation" (Replogle 1995, p. 4). This concept places more attention on accessibility rather than mobility.

Louth (1997) contends that much of the air quality problems facing cities today can be contributed to peak-hour traffic congestion on the roadways. In his case study of Cambridge, England, Louth (1997) points out that much of the traffic traveling into Cambridge during the morning commute is comprised of travelers from the rural areas surrounding the city. An

overwhelming majority, approximately 74%, are single occupancy vehicles that are forced to travel at the speed of a cyclist due to the congestion (Louth 1997). This mode of travel is completely inefficient and could be optimized with the implementation of a better-structured public transportation system including the use of double-decker buses. A double-decker bus has the ability to carry 80 passengers, and it only occupies approximately the same amount of space as two or three automobiles (Louth 1997).

A reduction of vehicles on the road would improve traffic flow by limiting stop and go conditions, and would also improve air quality since cars tend to be much less fuel efficient under these conditions. With frequent stopping, the engine is forced to work harder and fuel combustion is inefficient, which leads to higher rates of pollutants released into the atmosphere (Louth 1997). Incorporating a multi-modal transportation framework can reduce roadway congestion and improve traffic flow. Replogle (1995, p. 4) agrees that a multi-modal approach can help in “smoothing traffic flows to reduce sharp acceleration and deceleration.” Reducing stop and go traffic conditions will help reduce air pollutants.

Alternative forms of transportation are not well received by the motoring public in the United States. Public transit is rigid with set arrival and departure times which limit the flexibility that most Americans desire. In order for a multi-modal approach to make a difference, the education of the public motorist is imperative. It may be necessary to explain the tax subsidies and hidden costs of operating an automobile such as the impact of driving along on air quality and the cost of roadway maintenance and construction. In some cases, development of congestion pricing criteria to charge motorists for these costs may be beneficial (Replogle 1995). Government policy is necessary to promote the change in travel behavior. Socially engineering the mid-set of the society as a whole is necessary to accomplish the goal of a multi-modal transportation approach.

## EVANSVILLE REGION AIR QUALITY

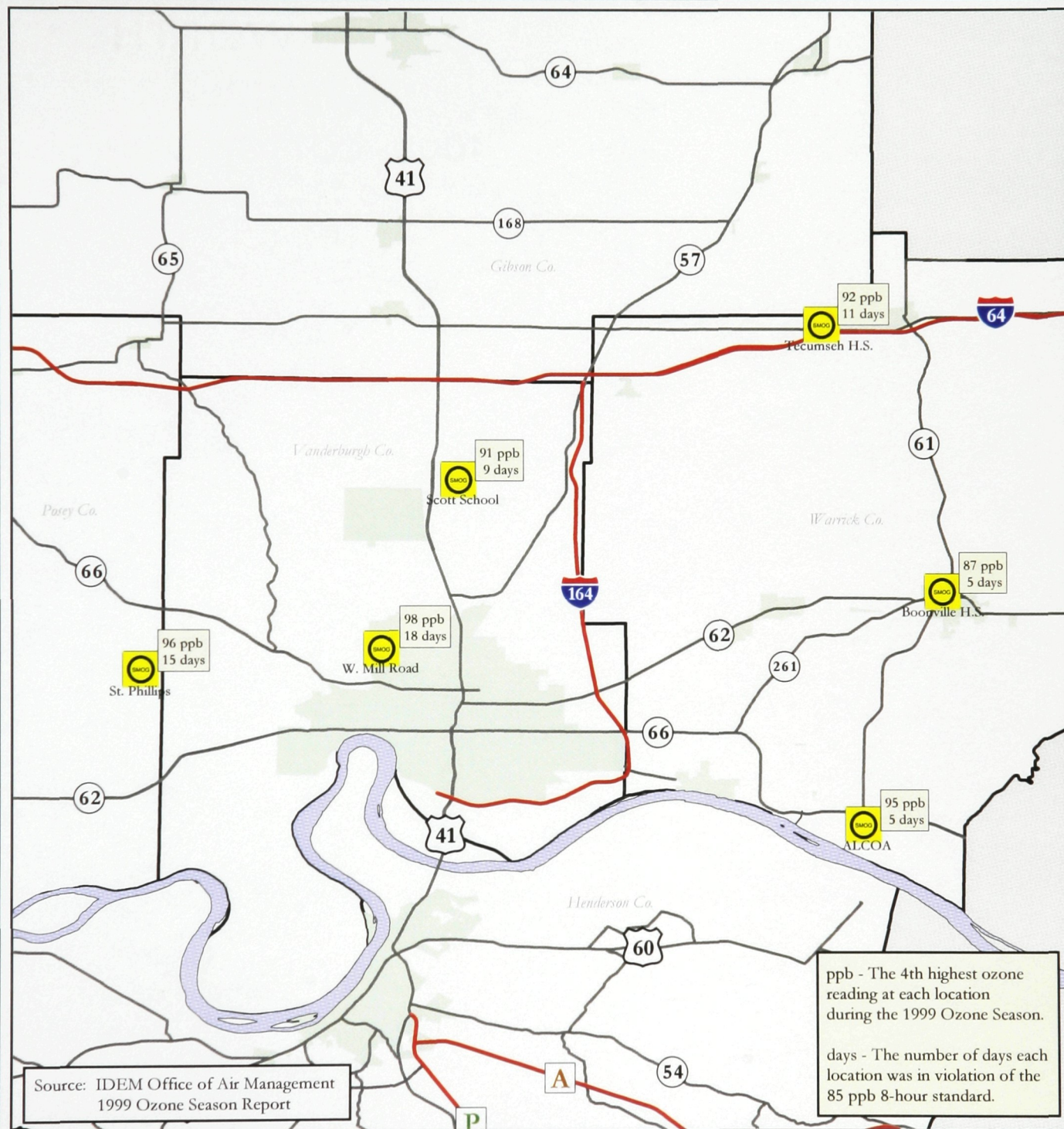
Regional air quality is a major concern within the Southwest Indiana Region. According to data tabulated by the Indiana Department of Environmental Management (IDEM) Office of Air Management, the Evansville region is one of six metropolitan areas in the state that is in violation of the 8-hour ozone standard established by the EPA in 1997 for the 1999 summer ozone season (IDEM 2000). According to the report, “the eight-hour standard is 85 parts per billion (ppb) and is based on an average of the 4<sup>th</sup> highest 8-hour ozone readings over a three-year period” (IDEM 2000, p. 1). IDEM operates 33 ozone monitoring facilities across the state and all but one, the Bristol Facility in Elkhart County, achieved readings higher than the allowable 85 parts per billion.

Ozone readings for the region are collected at six locations (Figure 3) in Posey County (St. Phillips), Vanderburgh County (W. Mill Road and Scott School), and Warrick County (Tecumseh High School, Boonville High School, and ALCOA). These monitoring stations collect ozone data daily to determine the 4<sup>th</sup> highest reading during the ozone season, which typically runs from May through September. The stations located at ALCOA and Boonville High School in Warrick County each had 5 days over the allowable 85 ppb, which is the lowest for the region. The W. Mill Road monitoring station located in the City of Evansville was the highest with 18 days over the 85 ppb limit and the St. Phillips station in Posey was a close second with 15 days. The 18 days over the 85 parts per billion established by the W. Mill Road station is tied for the lead among all 33 stations in the state with one from the Indianapolis metropolitan area. Evansville is the third largest city in the state; the number of days city ozone monitoring stations were over the allowable limit is consistent with those from Indianapolis. Figure 4 shows the ozone trend for the Mill Road Monitor from 1997 to 1999.



# Figure 3 - Southwest Indiana Ozone Data 1999 Ozone Season Report

30

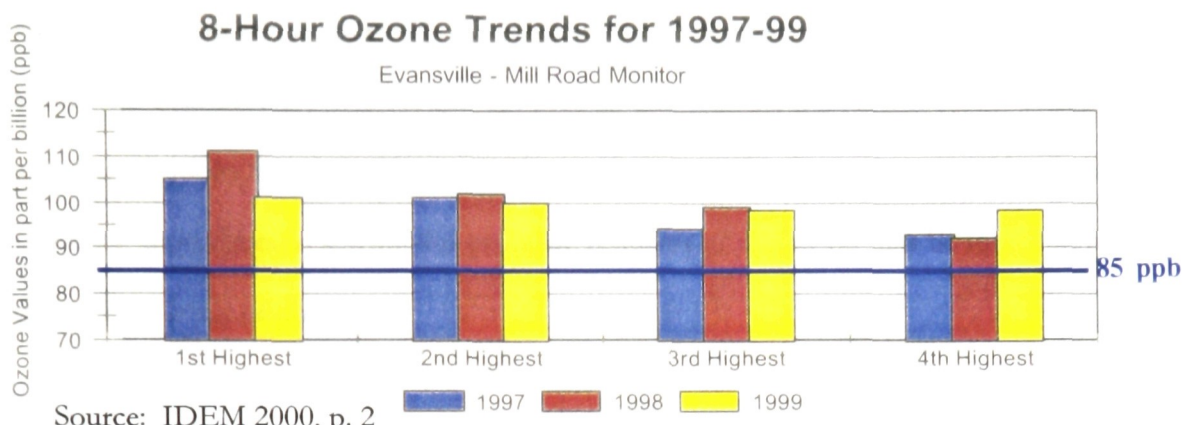


3 0 3 Kilometers  
3 0 3 Miles



- Ozone Collection Facility
- State Roads
- Interstate/Parkway
- City Boundary
- County Boundary
- Major Rivers



**FIGURE 4**

As the figure demonstrates, the 4<sup>th</sup> highest reading for this location is in excess of the 85 ppb level, although it does appear that overall a slight reduction in ozone values has occurred over time.

High levels of pollutants pose several problems for local residents and the environment. One concern is the potential of health repercussions due to prolonged exposure to pollutants. A research conducted by the Natural Resources Defense Council in 1996 ranked the “Evansville Metropolitan Statistical Area 32<sup>nd</sup> among 239 such areas in the nation for cardiopulmonary deaths caused by particulate air pollution” (Hayden 1996B, p. 1). The study estimates that possibly 52 people die annually in the region from pollution-related deaths (Hayden May 1996B). Although the study examines only particulate air pollutants and ignores ozone pollutants, levels are high enough that local citizens are at risk.

Another impact of air pollution on local residents is increased costs at the gas pumps for cleaner-burning fuel and improved pumping mechanisms, vehicle inspection costs, increased garbage pick up fees, and mandatory controls placed on local businesses (Hayden 1996A). Many cities have been forced to test all automobiles to ensure proper running conditions are being met, which comes as another cost for residents. If a vehicle is not in compliance, the vehicle

must be repaired before new license plates are issued. Special-burning fuels reduce pollution emissions but are also more costly. Landfills have also been found to produce pollutants that could lead to increased prices for garbage pick up and disposal (Hayden 1996A). These are just a few implications that air pollution problems may have for the community. Without taking proactive approaches to solving this problem, residents of the region may be forced to pay extra due to high levels of pollution.

## THE EVANSVILLE URBAN TRANSPORTATION STUDY FEASIBILITY STUDY

### INTRODUCTION

The problem of congested roadways and ever-increasing travel times is an important issue facing the Evansville Region. The region is host to many large employers and the City of Evansville serves as the hub city for commerce, employment, transportation, and industry. Traffic congestion on major thoroughfares with the City of Evansville and Vanderburgh County has increased over recent years and Evansville has experienced residential and commercial growth. Many residents and commuters complain that Evansville has too many traffic signals, and the city has earned the nickname of “the Stop Light City.” As traffic congestion increases over the next few decades, as is anticipated, the roadways will only become more inadequate. Therefore, it is essential that future transportation planning for the region include alternate modes of travel that incorporate the use of higher-occupancy vehicle travel and increased public transit utilization.

The purpose of this study is to lay the foundation for future implementation of aggressive transportation planning policies that will lead to a reduction in congestion and delay through reduction in vehicle miles traveled. Air quality benefits from a reduced number of vehicles on the roadway, increased utilization of public transit, and improved access and mobility for bicycle and pedestrian traffic could improve the quality of life and livability within the entire region.

To gain a better understanding of current park and ride programs in the United States, the Evansville Urban Transportation Study staff contacted Metropolitan Planning Organizations of similar size. Information on park and ride functions in Boston, New York, Los Angeles, or Seattle is not as important to the application of park and ride in a small to medium sized MPO like the Evansville Region. MPOs were selected from a directory listing all MPOs that included

a brief description of the various planning activities they conduct. MPOs were selected that have a similar population with park and ride or ridesharing programs. The following table details the MPOs contacted, their location, and population.

**TABLE 2 COMPARABLE MPOs CONTACTED**

\*Indicates some form of park and ride study completed.

*San Luis Obispo COG	San Luis Obispo, CA	239,000
Housatonic Valley Council of Elected Officials	Brookfield, CT	190,000
Chittenden County MPO	South Burlington, VT	141,179
*Benton-Franklin COG	Richland, WA	148,000
Dane County MPO	Madison, WI	398,233
*North Front Range Transportation Planning Council	Fort Collins, CO	220,000
Merrimack Valley Planning Commission	Haverhill, MA	296,116
Gulf RCP	Gulfport, MS	312,368
Central Virginia Planning District	Lynchburg, VA	205,000
Roanoke Valley Area MPO	Roanoke, VA	196,352
Nashua Regional Planning Commission	Nashua, NH	186,959
Whatcom COG	Bellingham, WA	152,800
Albany Planning and Development Services	Albany, GA	112,000
*Portland Area Comprehensive Transportation Study	Portland, ME	120,000
*Durham-Chapel Hill-Carrboro MPO	Durham, NC	205,439
Richland County RPC	Mansfield, OH	126,137
Johnson City MPO	Johnson City, TN	82,400
*Charlottesville-Albemarle MPO	Charlottesville, VA	185,000

Source: EUTS (2000)

The smallest MPO contacted is the Johnson City, Tennessee, MPO with a population of 82,400 and the largest is the Dane County MPO in Madison, Wisconsin. The population of the Evansville Urban Transportation Study area is 183,087 and the average population for all MPOs contacted is 195,388. Of the 18 MPOs contacted, 11 have a population larger than EUTS and 7 have less population. The two largest MPOs contacted, Dane County MPO and Gulf RPC, indicated that no form of park and ride or carpooling is currently being used.

Of all the information gathered, none of the MPOs had completed a feasibility study prior to the implementation of the existing park and ride facilities. Most only included information on existing facility inventories. The Charlottesville-Albemarle MPO provided a map showing the existing park and ride locations with no supporting documentation. It selected lot locations solely based upon available land and proximity to major roadways. No consideration was given to studying the existing commute patterns.

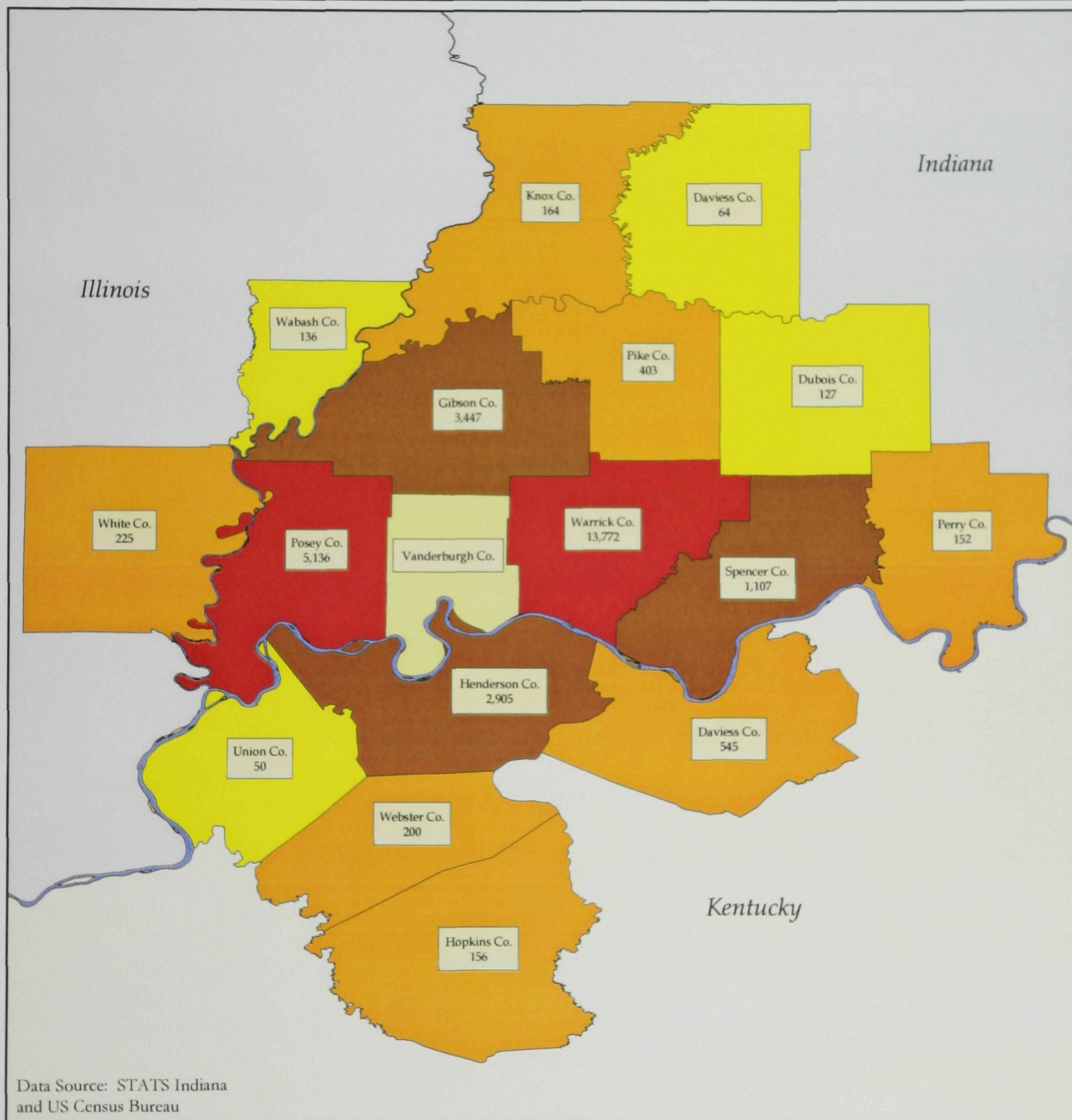
Therefore, this research is intended to provide a foundation for the possible implementation of park and ride facilities within the Evansville Region. Like others who based location only on available land and roadway facilities, this research also examines the existing employment trends of the region through a short employee survey of local businesses, reviews other commuter data, and reviews current congestion and roadway problems.

## **STUDY AREA**

The study area defined for the research includes all counties that have more than 50 or more daily commuters traveling to Vanderburgh County (see Figure 5). Vanderburgh County was chosen as the center for the study since, as previously stated, it serves as the regional center. Commuter data were collected and analyzed from two primary sources: the 1990 US Census Bureau and the Indiana State Data Center Commuter Data. The Indiana State Data Center



# Figure 5 - Commuter Volumes into Vanderburgh County



10 0 10 Kilometers  
10 0 10 Miles



## Daily Commuter Volumes

50 - 149
150 - 999
1,000 - 4,999
5,000 +

commuter data is based upon 1997 tax return responses to the county of residence and employment questions. These data could be gathered only for Indiana Counties, so commute patterns from Illinois and Kentucky counties into Vanderburgh County were collected from the US Census Bureau. Although 1990 Census Data are somewhat outdated, they should still provide general information on commuter information that are applicable for the purpose of this research. However, once available, 2000 Census Data should be examined to discover new trends and any differences in commuting rates.

The origin and destination data collected from these sources provides an overall view of commuting trends within the study area. The cut-off established at 50 commuters per day was established to only account for counties that would have sufficient commuting populations possibly warrant the construction of a park and ride facility. The study area is comprised of 17 counties; 10 from Indiana, five from Kentucky, and two from Illinois. The state road network of Vanderburgh County is comprised of one major north-south corridor and two major east-west corridors (see Figure 6). US-41, which serves as the major north-south corridor and only river crossing from Kentucky into Vanderburgh County, is a heavily congested multilane road. Within Vanderburgh County, traffic counts on this roadway are as high as 55,272 vehicles per day (April 2000) at the interchange with the Lloyd Expressway. Over a four-year period, traffic volumes at this location have increased by 2,252 vehicles per day. Traffic volumes increased from 36,688 (January 1996) to 39,628 (April 2000) between Lincoln Avenue and Bellemeade Avenue, from 34,480 (January 1996) to 36,435 (April 2000) north of Morgan Avenue (SR 62), and from 37,058 (January 1996) to 39,167 (April 2000) at the Indiana-Kentucky State Line. In general, traffic counts along the corridor have increased over the four-year period. However, counts have decreased at some isolated intersections throughout the county.







US-41 serves as the main north-south truck route for the region. Although I-164 was developed with the intention to serve through truck traffic, truckers in general still prefer US-41. If a run is timed correctly, a truck driver can avoid many of the signals along the corridor. However, during peak travel times when overall speed on the roadway is slower due to congestion, trucks are forced to stop at many of the 19 signals along the US-41 Corridor through Vanderburgh County. When forced to restart from a stopped position, trucks are very slow and therefore slow traffic on US-41. Reducing the number of vehicles on US-41 through increased high-occupancy vehicle traffic would reduce the overall delay along the roadway.

The Lloyd Expressway (SR 62/66) is the major east-west corridor serving Vanderburgh County. Much of the commuter volume from Warrick and Posey County utilizes this roadway. Traffic volumes on the Lloyd Expressway are highest at the interchange with US-41, with daily traffic volumes reaching 70,636 (April 2000) vehicles per day. The Lloyd Expressway has experienced increased traffic volumes in many areas due to recent development. New developments at Burkhardt Road and the Lloyd Expressway, the location of a Super K-Mart, Super Wal-Mart, Circuit City, and proposed Super Target, Cross Pointe Boulevard and the Lloyd Expressway, Red Bank Road and the Lloyd Expressway, and I-164 and the Lloyd Expressway have added significantly to congestion along the corridor.

Congestion is heavy on the Lloyd Expressway during peak hours of travel, partially due to the signalization of many intersections. The Lloyd Expressway has 15 traffic signals from the interchange at I-164 to Boehne Camp Road in Vanderburgh County. The majority of the roadway is a six-lane facility. However, with the numerous traffic signals, stop and go traffic is prevalent during peak hours.

The same can be said for Morgan Avenue (SR 62), serving the east portion of Vanderburgh County and Warrick County, and Diamond Avenue (SR 66), serving the west

portion of Vanderburgh County and Posey County. These facilities also serve as major east-west corridors and have many traffic signals that slow traffic. Both Morgan Avenue and Diamond Avenue are classified as arterial roadways.

Many local roads are also highly congested. As shown in Figure 7, current congestion along many corridors in Vanderburgh County is very heavy. Congestion is very heavy along secondary corridors such as Green River Road, Burkhardt Road, Oak Hill Road, First Avenue, Lynch Road and Lincoln Avenue. Figure 8 shows future congestion conditions of the Vanderburgh County roadway network if no major improvements are made to existing roadways. Figure 9 shows what the transportation network congestion levels could be with improvements from the EUTS Six-Year Plan implemented. Although congestion has been reduced on many roadways, many still face high levels of congestion that will continue to reduce travel times and create high levels of pollution.

As these maps demonstrate, implementing roadway improvements alone will not be sufficient to reduce transportation congestion on the roadways within Vanderburgh County. Roads can only be upgraded or additional travel lanes can only be added a limited number of times before the improvements will no longer benefit traffic flow and reduce congestion and delay. Therefore, transportation planning within the region must incorporate additional methods to help reduce anticipated congestion. Supporting park and ride or park and pool programs could be a progressive step towards improved traffic flow and improved air quality.

## **EUTS EMPLOYEE SURVEYS**

To gain a better appreciation for current commuting trends within the study area, many of the larger employers within the region were recruited to distribute a survey among employees. With the help of the Metropolitan Evansville Chamber of Commerce, more specifically Ms. Sally Rideout-Lambert, approximately 30 businesses were sent letters requesting their help for this

# Figure 7: 2003 Transportation Network

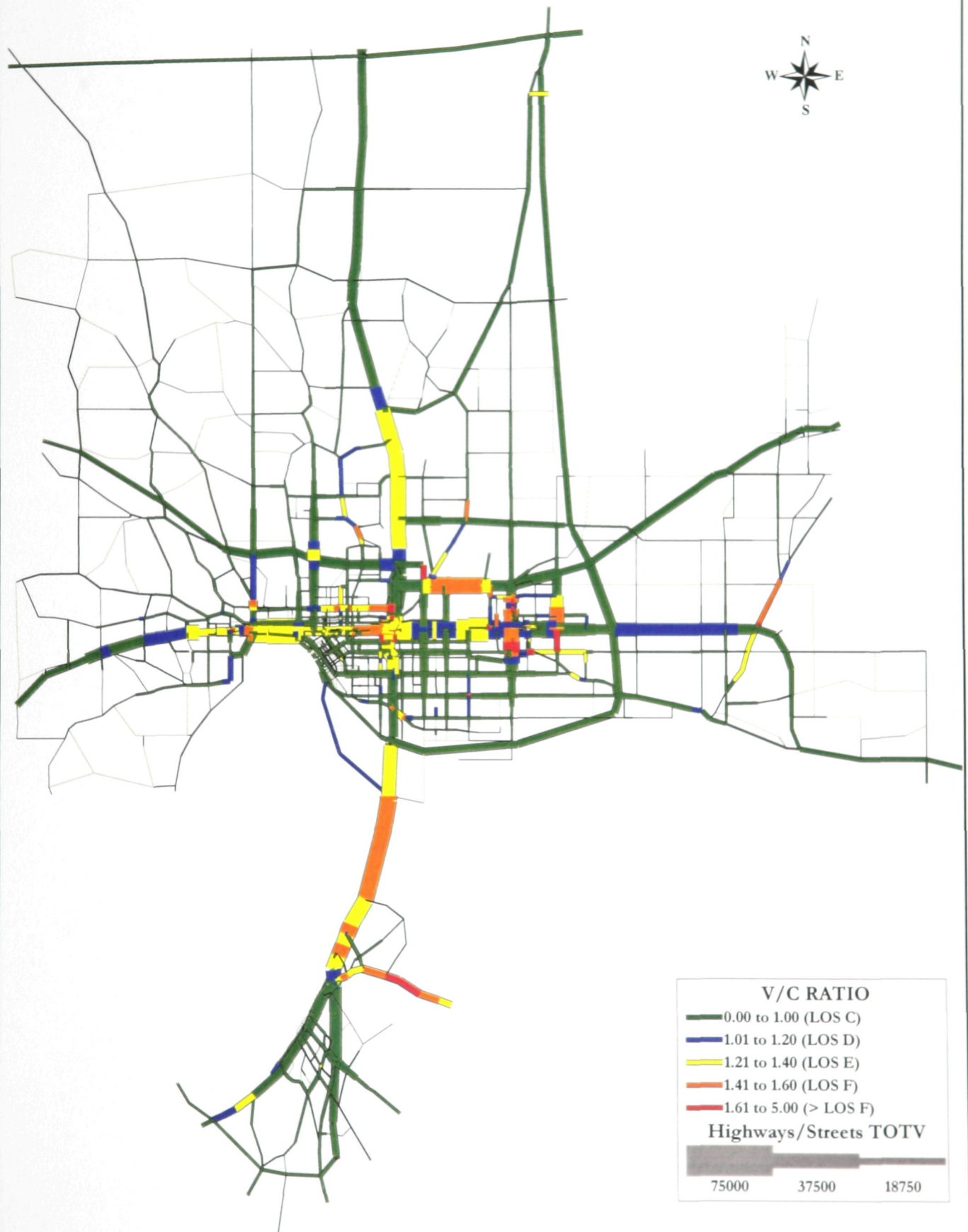
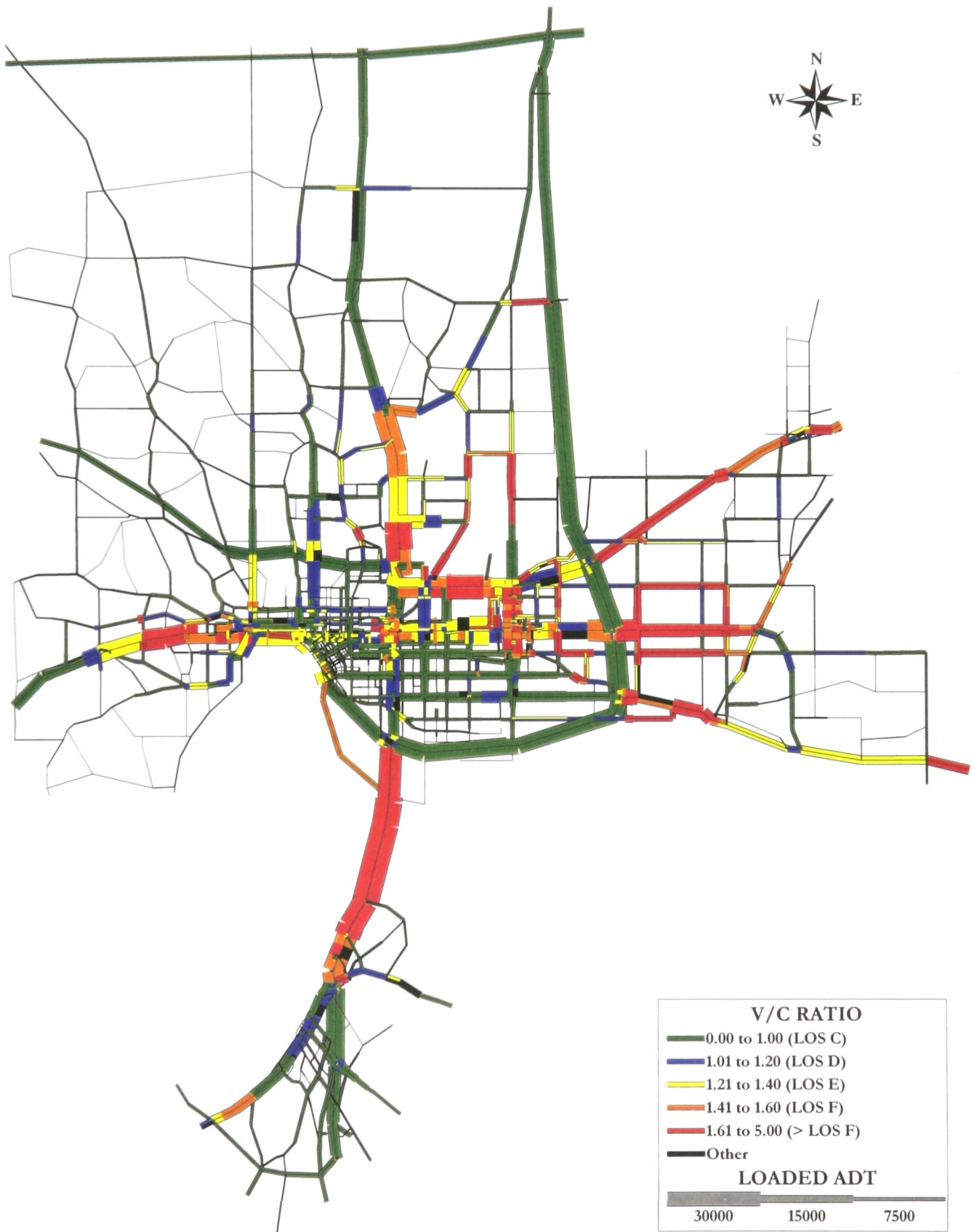
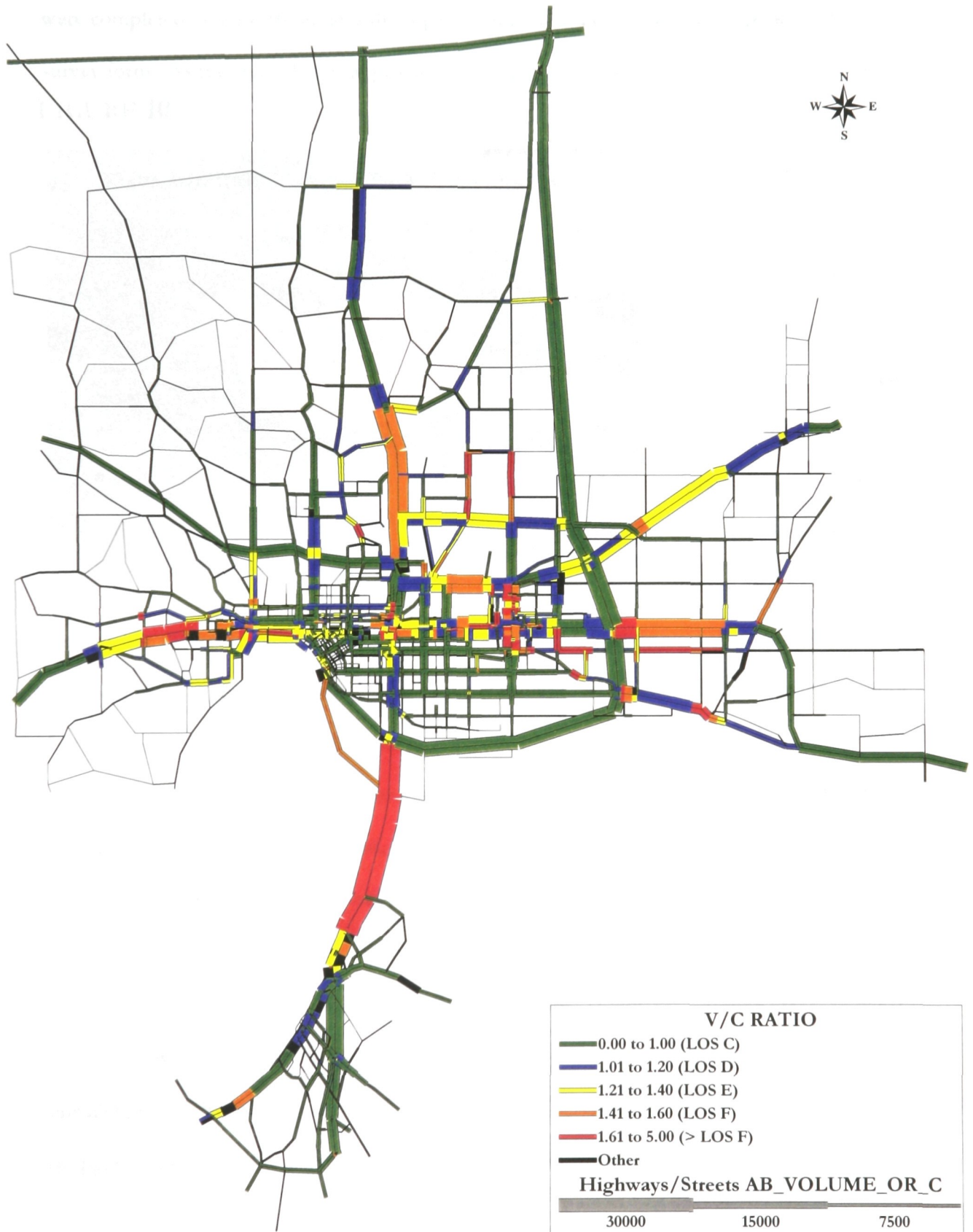


Figure 8: 2025 Trips on 1995 Network



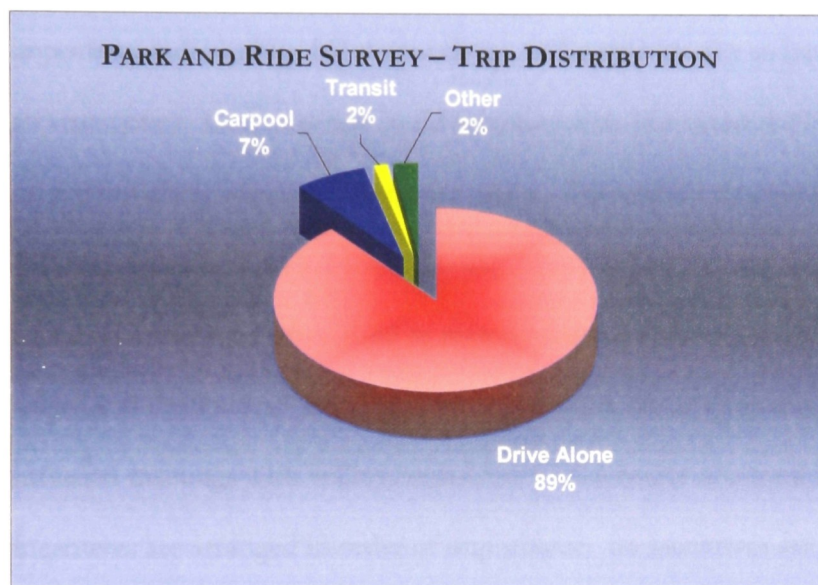


# Figure 9: 2025 Trips on 2003 Network



study. Only 6 companies were willing to participate, and a total of over 500 employee surveys were completed. Figure 10 outlines the trip distribution of those submitting a park and ride survey form. As the chart shows, approximately 89 percent of those surveyed chose to drive

**FIGURE 10**



alone while 7 percent carpool, 2 percent use public transit and 2 percent use other forms of transportation such as cycling or walking. When calculated for those who work in Indiana but who live in Kentucky and/or Illinois, 89.5 percent drive

alone, while the percentage of carpoolers is 8.5 percent and 2 percent use some other form or transportation. Approximately one third of those surveyed who live in Illinois currently carpool, but only 10 percent from Kentucky do.

The Park and Ride Survey also asked if respondents would be willing to try carpooling. Of those who answered the question, 134 people, approximately 37 percent, said they would be willing to try carpooling and 230 said they would not. When broken down further, approximately 75 percent of workers living in Illinois would consider carpooling, as would 54 percent living in Kentucky. These figures clearly show that employees traveling across multiple counties to work are more willing to try new, more efficient ways to get to work. Reasons for an unwillingness to try carpooling ranged from mild disdain for the option to the necessity of dropping off kids at school or work schedules that would not promote carpooling as an option.

The respondents were also asked to indicate what incentives might entice them to consider carpooling. The form had the following six incentive categories: Awards and Prizes, Flexible Work Schedules, Priority Parking for Carpoolers, Guaranteed Ride Home in the Event of an Emergency, Help Finding a Carpool, or No Incentives are Necessary. The incentive most important, indicated by 161 respondents, is the opportunity to have a ride home in the event of an emergency. Corporations could accommodate this incentive by providing company vehicles or taxi vouchers when an emergency arises. The second most important incentive, indicated by 112 respondents, is assistance in finding others willing to carpool. In larger communities, web-based data bases are often used to match potential carpoolers with others that share a common origin and destination. Smaller cities may require the assistance of the employer to conduct informal meetings with willing carpoolers to determine common interests. The remaining four incentives are arranged in order of importance: no incentives are necessary (87), awards and prizes (82), flexible work schedules (82), and priority parking for carpoolers (77).

As a result of this study, companies should be encouraged to incorporate any or all of these incentives to promote carpooling within the work place. In a factory atmosphere where employees work regular shifts, daily, flexible work schedules would not be an option, but providing parking close to the entrance so employees have less distance to walk or providing monthly rewards or parking fee waivers might be great incentives. Almost all employers could provide help to workers wishing to find others within the company that were also willing to carpool or to provide the means for an emergency ride home.

## **EUTS EMPLOYMENT ACCESSIBILITY STUDY**

The *EUTS Employment Study*, conducted in 1998 by the Evansville Urban Transportation Study, focused on the growing trend of traffic congestion and the increased demand for roadway

space. The study points out that the “increasing awareness of financial, social and environmental costs of roadway expansion has led many to believe that roadway expansion, by itself, is not the best solution” for transportation planning (EUTS 1998, p. iv). Therefore, it is a goal of the Evansville Urban Transportation Study to implement, when appropriate, measures that will more efficiently utilize existing roadway facilities, improve access to commercial and work environments, and improve air quality. By implementing Transportation Demand Management (TDM) strategies, many of these issues may be addressed.

Eighty-six regional employers agreed to participate in the survey process. The focus of the survey was to determine transportation-related problems facing each employer and to establish the foundation for TDM strategy implementation. Some of the employers surveyed indicated that various TDM strategies are currently available for employees. Approximately 35% offer some form of flexible work schedules, 31% support bicycling, 19% encourage transit use, 16% offer a compressed work week, 8% encourage carpooling, and 5% permit telecommuting. Of those not currently encouraging TDM strategies, approximately 37% of the employers surveyed were willing to promote public transportation use, 31% would promote carpooling, and 22% would encourage flexible work schedules and bicycle facilities. Compressed work weeks and telecommuting were also considered by employers, but were not deemed as widely acceptable forms of TDM.

The research conducted by the EUTS staff for the *EUTS Employment Study* and this *Park and Ride Feasibility Study* indicate that TDM strategies, especially park and ride or carpooling facilities, have the potential for success within the region. Improved air quality and reduced congestion can be accomplished through the implementation of any of the TDM categories discussed in this research. Park and ride or carpool facilities are a workable approach for a region such as the Evansville area due to the number of large employers, especially factories, that



encourage workers to drive longer distances to work due to better benefits and work conditions than those that may exist in surrounding rural counties. Compressed work weeks, telecommuting, and transit promotion are all positive forms of Transportation Demand Management but are not practical on a larger scale. Transit services are limited only to the City of Evansville and the City of Henderson, and compressed work weeks and telecommuting are not feasible in many working environments. However, park and ride can serve a large portion of the population if located in highly visible, accessible locations.

## **TRAVEL DEMAND MANAGEMENT**

Roadway congestion is a growing problem facing communities in the United States and around the world. Historically, the solution to increased congestion has been the construction of new roadway facilities. However, due to environmental, political and often financial constraints, the construction of new roadways is not always feasible. Therefore, it has become an important aspect of transportation planning to incorporate innovative planning measures to combat continued congestion.

Traffic congestion can be created by accidents on the roadway, construction, maintenance, detours, and too much traffic on the roadway. Roadway congestion impacts both the traveler and the employer. Strickland and Berman (1995) point out that – “to the traveler, congestion means lost time, missed opportunities, frustration, and waste of personal resources. To the employer, congestion means lost worker productivity, delivery delays, and increased costs.” It is estimated that commuters in the Los Angeles area spend 56 percent of their commute time in stop and go traffic, and this number is anticipated to reach approximately 70 percent by the year 2020 (Samuel 1999). A study completed in 1995 by Lehner International Inc., estimated that “rush hour traffic could be costing businesses about \$25 billion annually”

(Martinez 1995, p. 19). Total daily time lost to congestion for all of the 108 million Americans who drive to work is approximately 900 million hours, which is equivalent to about 225,000 average work weeks (Martinez 1995). These figures are staggering, but businesses that incorporate TDM strategies can alleviate some of the delay resulting from roadway congestion.

Congestion management strategies attempt to manage the problem of congestion by reducing or maintaining current levels of vehicular traffic during periods of travel and by reducing the utilization of single occupancy vehicles (Madden 2000). Many communities have developed methods to mitigate congestion through technological improvements and public policy implementation. Three key ways to promote existing transportation network facilities while combating congestion-related problems are by increasing the use of multimodal transportation such as public transit, carpooling, and bicycling or walking, providing alternative trip distributions through land-use guidelines, varying work schedules, telecommuting and congestion pricing, and by improving traffic flow through the use of Intelligent Transportation System (ITS) devices, signal improvements and incident management (Strickland and Berman 1995).

### **Flexible Work Schedule/Compressed Work Week**

Flexible work schedules allow employees to stagger times of arrival to reduce the overall number of trips made during the peak hour. Employees may be required to be at work between certain hours (for example, between 10:00 and 3:00) but are permitted to arrive and leave before and after (Madden 2000). An experiment conducted in San Francisco evaluated employees given the option of flexible work schedules. Approximately half of the eligible employees arrived at least 30 minutes early. Overall, commuters saved approximately nine minutes of travel

time per trip, which equates to about 1.5 hours of saved travel time per week. Over 60 percent stated that they encountered greatly reduced congestion (USDOT 1992).

Compressed work weeks also encourage reduced travel during peak hours by allowing employees to work longer daily shifts and reduce the number of days worked per week. Many government employees, approximately 9,000, from the City of Denver participated in an experimental program utilizing a compressed work week. On average, employees arrived one hour earlier and left one hour later. Instead of working five, eight hour days, employees worked four, ten hour days (USDOT 1992). A compressed work week reduces the number of vehicles travel during the peak hour because employees arrive earlier and leave later than usual peak hours, plus employees do not have to travel to work at all one day a week. The flexible work schedule and compressed work week is an effective program for congestion reduction and employees, but it may not be suitable in all working environments.

### **Telecommuting**

Telecommuting allows an employee to work away from the main office, greatly reducing the number of vehicle miles traveled per day. Employees may work out of the home or at a designated work area located closer to the home. Many feel that telecommuting is a win-win situation for employees and employers. Employees may work in a more relaxed, comfortable environment and still provide productivity for the employer. Employers with happy employees tend to gain more productivity, and employers can reduce the need for high cost office space with reduced employees in the office daily (Mariani 2000).

In 2000, approximately 8 million people participated in some form of telecommuting for work; the figure is expected to grow to approximately 13.5 by the year 2002 (Kosan 2000); and by the year 2030 as many as 200 million Americans may use telecommuting as their primary

means of work (Whitford 2000). Today, approximately 40 percent of jobs are compatible with telecommuting (Wolf 1999). With improvements in technology and information sharing capabilities, it is reasonable to assume that telecommuting will become an integral part of the work force in years to come.

### **Congestion Pricing**

Congestion pricing is a relatively new method aimed at reducing air pollution caused by congested roadways and rush hour traffic. The basis of congestion pricing involves “fees charged for driving on specific roadways during times of dense traffic” (Jackson-Stephens 1997, p. 1). The theory behind the program would encourage the use of alternatives to driving, alternative travel routes, or travel during non-peak hours. A fee is charged for the use of the roadway depending on the time of day and traffic congestion when used. A higher fee is charged when the roadway is close to capacity and during rush hours. A reduced fee is charged during non-peak hours (Jackson-Stephens 1997). Toll booths are set up along the roadway to automatically read an electronic card that must be purchased before being allowed to travel in the special lanes. The concept is self explanatory, but convincing the public is another issue. However, the concept is similar to that used in the airline and telephone industry. During peak times you pay more for airline flights and telephone calls.

Several metropolitan areas throughout the US have developed or explored the concept of congestion pricing on their busy roadways. According to research conducted by the Texas Transportation Institute, in 1992 the cost of congestion in its 13 major metropolitan areas was more than one billion dollars (Finch 1996). Estimates indicate the cost is much higher in other cities: Los Angeles - \$8 billion, New York City - \$7 billion, and \$3 billion each for San Francisco, Oakland, Chicago and Washington D.C. (Finch 1996).

The first model congestion pricing facility was constructed along a 16-kilometer length of Route 91 near Anaheim, California (Finch 1996). Four new lanes, often called high-occupancy and tolled (HOT) lanes, were constructed in the median of the existing highway, two in each direction. The California Private Transportation Company (CPTC) implemented the project. It predicted that the new, tolled travel lanes could save motorists between 20 to 40 minutes of travel time each way (Finch 1996). The cost of utilizing the additional lanes varies throughout the time of day and would vary between \$0.25 and \$2.50 depending on time of use. Penalties were established for travelers who did not have a sticker or who were traveling alone (Finch 1996).

After six-months of use, the results of the experiment were better than anticipated. According to a study published in the July 1996 issue of Planning (p. 5), “more and more people are making what promoters call ‘the lane change that could change your life’ by using a special segment of Route 91 linking Riverside County with other parts of the Los Angeles area.” Use of the new facility increased every month over the six-month period. By June 1996, approximately 22,000 vehicles used the roadway per day (Planning 1996). The CPTC estimated that within six-months, 30,000 users would have purchased the electronic card for the program but the actual number was closer to 50,000. Many users claim to save as much as 45 minutes each direction (Planning 1996). The preliminary results indicate that the system can function efficiently and to the likes of commuters in congested urban areas.

This HOT Lane program concept was applied successfully in Anaheim, California. As a by produce, the Metrolink train system received many users during the first few weeks. Traffic congestion on the free travel lanes dropped to levels not seen since the early 1980s (Finch 1996). According to more recent publications, the HOT lane program has been a success and is still functioning as designed. The program was so successful that a second program was

implemented on Interstate 15 north of San Diego (Economist 2000). The tolls in San Diego are slightly higher for use though, ranging from \$0.50 to \$4.00. Other communities in Texas and Florida have also implemented similar programs (Economist 2000).

One major drawback to HOT lanes is the necessity to construct new travel lanes. Many urban areas do not have the ability to construct new facilities due to limited space and roadway visibility. A new spin-off of HOT lanes has been developed that may be more practical in such urban areas. The idea developed by Patrick DeCorla-Souza (2000) would incorporate FAIR (Fast and Intertwined Regular) lanes. The existing roadway travel lanes would be divided into two sections, FAIR lanes and regular lanes. FAIR lanes would use an electronic tolling device similar to those used on HOT lanes to deduct a toll for the use of that lane. Tolls would also be based upon time of day and roadway capacity as in HOT lanes. Travelers choosing to utilize the regular lanes, free of charge, and endure the headaches of congestion would actually earn credits towards future use of the FAIR lanes. Therefore, if a traveler were in a hurry one day he or she may use the FAIR lane, but for general use he or she may wish to use the regular lane and earn credits (DeCorla-Souza 2000).

This concept would provide incentives for both lanes of travel and would not require additional travel lane construction. Motorists would have the option of using the lane that best suited their needs on any given day. Research conducted on the HOT lane system in the LA area has shown that travelers choosing not to pay an additional toll to travel the roadway still value the option of having the HOT lanes to use when necessary (DeCorla-Souza 2000). It is feasible that the FAIR lane concept could be implemented in areas with heavily congested corridors, on unused or underused HOV (high occupancy vehicle) lanes, when additional travel lanes are constructed, or on toll roads once the toll is removed to continue funding of the road maintenance (DeCorla-Souza 2000). Another advantage to the program is the availability of

funding to test FAIR lanes “through FHWA’s Value Pricing Pilot Program, which is authorized by the Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21)” (DeCorla-Souza 2000 p. 19).

Another way to implement congestion pricing is through fees for parking, especially for single-occupancy vehicles, in metropolitan areas. While parking is free, single-occupancy vehicle travel is encouraged, but when charges are placed on parking, commuters have the option to pay more to drive alone or they may choose to try public transit, car pooling, or park and ride. Research by Calthrop and Proost (2000) indicates that approximately 95 percent of workers in the United States park for free at work compared to 58 percent and 39 percent in London and Cape Town, respectively. Louth (1997), in a case study of Cambridge, England, explains that currently there are more than 40,000 free parking spaces within the city, which contributes to single-occupancy vehicle use. The same is true in many urban areas. Commuters will continue to travel alone until the cost of driving alone, be it through roadway congestion pricing or parking fees, forces them to explore alternative modes of transportation.

There are several ways to implement parking pricing programs either by government agencies or private developers. Government agencies may “impose or increase fees and surcharges for solo drivers or long-term parkers in public parking facilities, give price preference to car and vanpoolers, impose parking pricing through regional regulations, for example air quality regulations” (USDOT 1992, p. 1), and other creative measures that should be tailored to individual city circumstances. Private entities can “remove, reduce or cash out employer provided parking subsidies, reverse ‘early bird’ or monthly discounts favoring long term commuter parking, [and] impose parking pricing and discount parking for car-poolers where free parking prevails, or where car-poolers enjoy no price breaks” (USDOT 1992, p. 1). Any of these methods can be used to encourage the use of high-occupancy vehicles or require that persons pay a premium price for driving alone.

The USDOT (1992) “Parking Pricing” report indicates that several communities have implemented measures to discourage single-occupancy vehicle travel. Madison, Wisconsin, increased parking fees during peak periods at city parking lots and garages; Seattle, Washington, discounted downtown parking for carpools; and San Francisco implemented a public parking tax, which increased parking rates within the city. Private businesses in Bellevue, Washington, Los Angeles, California, and Montgomery County, Maryland, initiated “parking pricing on employees along or in combination with travel allowances, or provided effective parking subsidies to rideshare patrons” (USDOT 1992 p. 1).

When travel-pricing policies are implemented correctly, the percentage of drive-alone passengers could reduce significantly. From the case studies analyzed in this report, decreases from 12 to 42 percent in drive-alone rates were experienced in municipalities and private corporations throughout the United States (USDOT 1992). Additional research has indicated that implementing parking fees at the workplace can reduce the number of single-occupancy trips by approximately 40 percent (Calthrop and Proost 2000). Often times, increased parking rates alone are incentive enough to deter drive-alone commuters. If increased parking rates do not provide the desired results, multiple price increases may be necessary. As the research indicates, parking pricing and congesting pricing are ways to discourage single-occupancy vehicles and promote alternative modes of travel.

## **PARK AND RIDE**

Another form of Transportation Demand Management prevalent in many communities is the use of park and ride facilities to encourage higher occupancy vehicular travel. People with a common destination can meet in a designated park and ride lot and then carpool or use transit, where available, to commute to work. The overall objective of carpooling is to reduce vehicle



miles traveled, pollutant emissions, and congestion while providing a safe and efficient means of travel for commuters. Although carpooling may seem to be restrictive in application, the underlying benefits do make it a sound commute option.

The love affair with the automobile is a long-standing tradition in the United States that many find hard to overcome, even when faced with commute delays and decaying air quality. Over 90 percent of all trips made by the automobile are less than 10 miles in length (Ho 2000), and these often could be accomplished by other more environmentally friendly means. In the US there are over 200 million automobiles, 4 trillion miles are driven daily and over \$100 billion spent annually on road projects at the national, state and local level (Ho 2000). Cities are faced with increasing congestion, gridlock during heavy commute hours, and pollution.

The US is not the only country hampered by overuse of the automobile. In Canada, many of the major cities and suburbs are also experiencing the woes of an automobile-dominated society. Research shows that in Vancouver, from 1985 to 1992, travel time on the road increased, travel distance increased and travel speed decreased (Canada 1996). In the province of Ontario, a 1990 study estimated that approximately \$100 billion was spent annually on interest collecting from bonds used to construct new roadways (Canada 1996).

## **Benefits**

When well planned and studied, park and ride facilities can provide benefits for everyone traveling the roadway network. Users benefit from reduced congestion, reduced fuel costs, reduced pollution emissions, less vehicle depreciation and reduced maintenance costs. The community benefits from reduced congestion on the roadways, shorter commuting time, improved air quality, reduced noise pollution, and often increased use of public transit (Stutts 1989). The benefits from park and ride facilities is subjective though. As drivers, we take for granted car repairs, time waiting in traffic jams, fuel costs, and the impacts of automobiles on the

environment. Typically dollar amounts are not equated with each of these benefits, which makes it difficult to convince a driver that there are more efficient modes of travel.

## **Incentives**

In order to attract new users to park and ride programs, cities often offer incentives. Usually, those incentives are some form of reimbursement for arriving at work in a high occupancy vehicle. Incentives often include subsidized parking, preferential parking, drawings for prizes and awards, and a guaranteed ride in the event of an emergency. A Long Island Region Improving Commuting (LIRIC) grant proposed paying carpoolers daily based upon use. Persons carpooling with one individual would receive \$3 per day and those riding with two other people would receive \$5 per day. Commuters could also choose the option of \$30 per year to use mass transit (Jochum 1996). In Providence, Rhode Island, reserved parking at the Providence Place Mall enables 500 HOVs to park daily at reduced rates. A vehicle containing “five persons pays 30 cents a day; 4 persons, 65 cents a day; 3 persons, \$1.25 a day; and 2 persons, \$2.50 a day. The \$2.50-a-day rate is one-fourth of the average Providence Place rate” (Tooher 2000). Conservative estimates indicate that commuters could save as much as \$50 per month in parking fees. Companies can even offer credit card incentives. MasterCard has developed a program called CardEx, which enables employers to credit the accounts of employees with points earned based upon mode of travel to work. The more efficient the transportation use, the higher the reward (CardEx 2001).

Bellevue, Washington, introduced a rideshare program in 1998, which has been very popular for the citizens. After only six years in existence, approximately half of all employees participated in the program. One of the main reasons for the success is the incentive package made available to carpoolers. The city will pay “\$15 a month to carpoolers, while solo drivers

pay \$35 a month” (Smith and Barnes 1994, p. 6). The impact of paying for parking, along with the available incentive for not driving alone, has enticed many residents to utilize the incentives. In reality, carpooling equates to a \$50 difference every month.

### **Characteristics of Potential Park and Ride Users**

Research has shown that some common trends are present in users of park and ride facilities, which may be helpful in the location and design of new facilities. As Stutts (1989) indicates, in an analysis of park and ride users surveyed in the Colorado Springs area, most users are in their 20s or 30s with a fairly even distribution of males and females, 48.2 percent and 51.8 percent, respectively. Between 70 percent and 95 percent are “classified as either professionals, managerial, clerical or office personnel” (p. 5), which supports the use of park and ride facilities by those who work a set schedule.

The Florida Department of Transportation, along with the Center for Urban Transportation Research (CUTR 1992), also evaluated park and ride users to examine trends of the commute pattern. Its findings show that rideshares typically have a longer commute than those wishing to drive alone, have fewer cars than the average home, work for large companies, work full-time and chose to carpool due to the savings in cost. This research provides useful insight to possible park and ride planners. However, due to regional differences in commute patterns and overall perception, the actual statistics may be different for each location.

### **Rules for Carpooling**

Groups participating in a park and pool program should establish certain rules to ensure success of the program. The main point of emphasis should be courtesy. Being polite and

tolerating others is the most important step. The following are other guidelines that are useful in an organized carpool program (Louisiana Department of Natural Resources 2000).

1. **Determine a Driving Schedule:** Drivers can rotate daily, weekly or monthly but everyone in the pool should have a responsibility.
2. **Establish Routes:** Determine the daily route and pick up times
3. **Arrive on Time:** Others should not be punished because of the tardiness of one person. Allowing a few minute grace period is suggested, but late arrivals may be penalized by the group or left if not there by an established “drop dead” time.
4. **Use the Pool for Commuting Only:** Reserve errands before or after.
5. **Encourage Communication:** Share phone numbers to inform others of emergencies.
6. **Form Rules on Smoking, Music, etc.**
7. **Maintain a Clean, Working Vehicle.**
8. **Drive Safely and Check with Your Insurance Company**

### **Park and Ride Lot Selection Criteria**

When determining the location for a potential shared-use park and ride lot, the following criteria should be considered to enhance the potential success (Stutts 1989):

**Lot Availability** – The shared use facility should have sufficient parking for the business use and for commuter use. A lot with few spaces will not be able to support multiple uses.

**Accessibility** – The lot should be located adjacent to a major roadway. Hidden or hard to get to lots will not be successful.

**Visibility** – Highly visible sites will be easier for commuters to find and will help to deter vandalism.

**Transit Service** – If available, park and ride lots should be located in conjunction with public transit to encourage alternative forms of travel.

**Development Cost** – Locations that require few improvements are recommended.

Alan M. Voorhees & Associates, on behalf of the FHWA, conducted an analysis of 150 existing park and ride facilities to determine the commuting habits of the users. The findings of the report indicate that every facility was located within 1.6 miles of a major arterial roadway. Lots that were more than 0.8 miles from a major roadway experienced substantially less usage. However, within the 0 to 0.8 distance from the roadway, no significant variation in use was determined. Therefore, as a rule of thumb, park and ride lots should be located within one mile of a major roadway used primarily as a commuter corridor (Benton-Franklin 1985).

A case study completed by the Greater Portland Council of Governments (1999) in Portland, Maine, supports these findings. According to research evaluating current park and ride facilities, lots located along major corridors with signs and good visibility have a much higher rate of use than those that are not. The Scarborough Lot located along the Maine Turnpike has a use rate of 104 percent, and the Freeport Lot with visibility from Route 1 and I-95 has a 66 percent use rate. However, the Westbrook Lot located in the Bradlees Shopping Plaza, which has poor sign identification and poor visibility, has only a 3 percent use rate. Even worse is the Gorham Municipal Lot located in the rear of the municipal building with no signing, pavement markings or visibility; it has a 0% use rate (GCPOG 1999). As this facility inventory demonstrates, the location of a park and ride lot is a key factor in the success or failure of the project.

When developing a park and ride facility or network it is essential to incorporate as much information as possible to ensure its productivity. There is significantly more to be done than just building a park and ride lot. An education outreach to the motoring public about the benefits of carpooling and other TDM measures is also important. Publications in newspapers, radio ads, television news coverage, and brochures or information distributed to local businesses and employees are all necessary components of a good public education program.

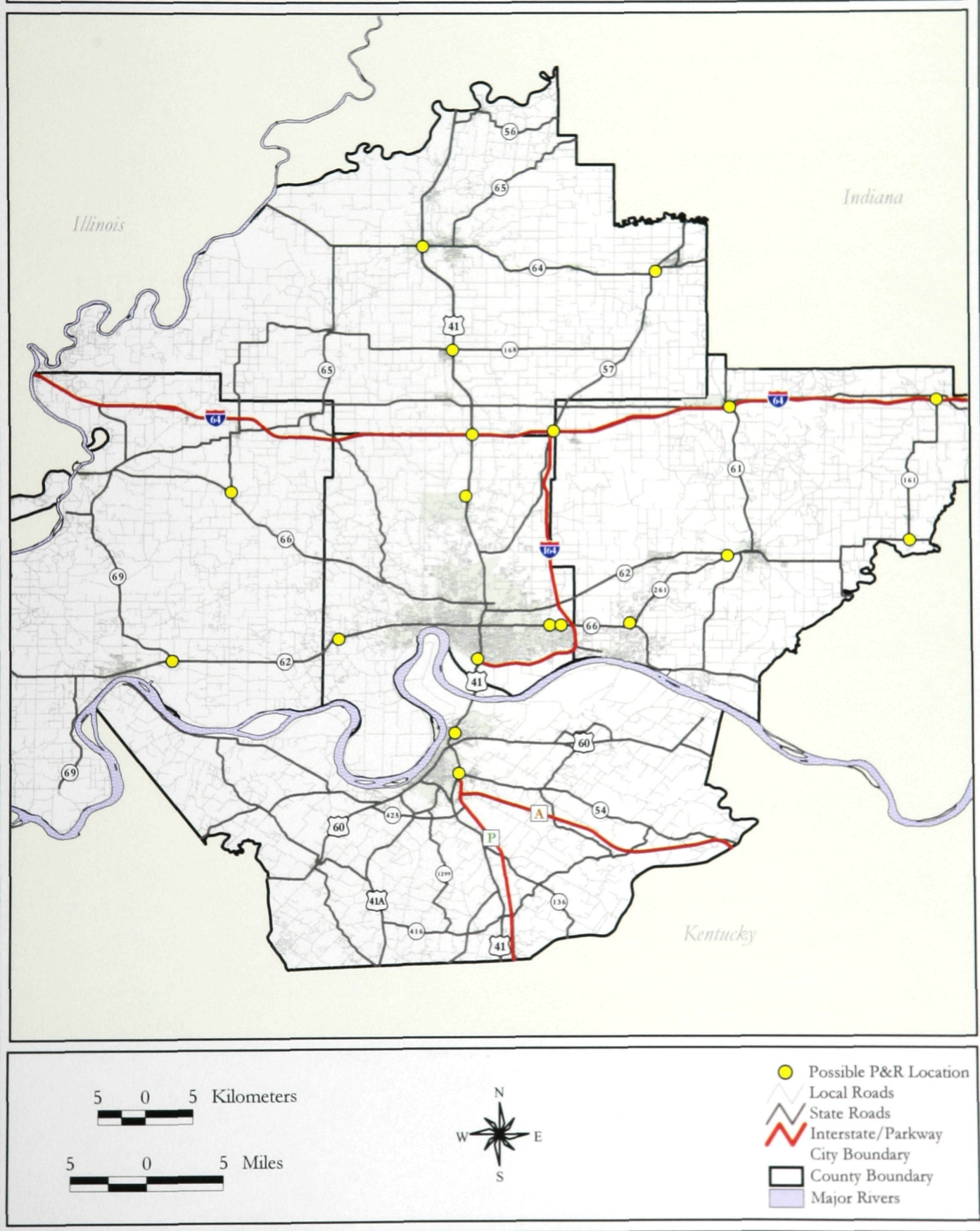
TDM measures cannot account for pollution created from industry and other sources, but they can reduce pollution caused by roadway congestion. Research shows that sprawl is occurring in the region, air quality is a concern with Vanderburgh County and surrounding counties being labeled as “non-attainment,” roadway congestion is prevalent, and traffic volume on roadways is increasing. The entire situation is exacerbated by the fact that almost 90% of commuters choose to drive alone. Travel Demand Management programs, including park and ride, are a solution to the growing transportation problems facing the region. They should be implemented to mitigate current congestion on the region’s roadways and to prepare the community to face certain congestion problems in the future as the population continues to grow and more motorists are on the roads.

## **IMPLEMENTATION**

The implementation of a park and ride system in the Evansville Region could reduce congestion and improve the overall air quality of the region. It is important that any park and ride facility be located adjacent to a major roadway with high visibility and easy accessibility. For an area such as the Evansville region, shared-use facilities would be the best form of a park and ride system. By creating a park and ride lot from existing parking, the cost would be minimal for the experimental lots and the opportunity would exist for users to run errands before or after work with ease. Another option would be to locate a lot in shopping centers that are vacant and that would allow ample parking for park and ride users.

There are several large shopping centers and vacant shopping centers throughout the region. Figure 11 shows several locations that may be suitable for park and ride facilities based upon survey response and knowledge of commuter patterns. Possible locations include the Wal-Mart or K-Mart shopping centers located at the intersection of the Lloyd Expressway and

# Figure 11 - EUTS Study Area - Possible Park and Ride Lot Locations





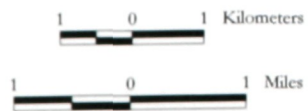
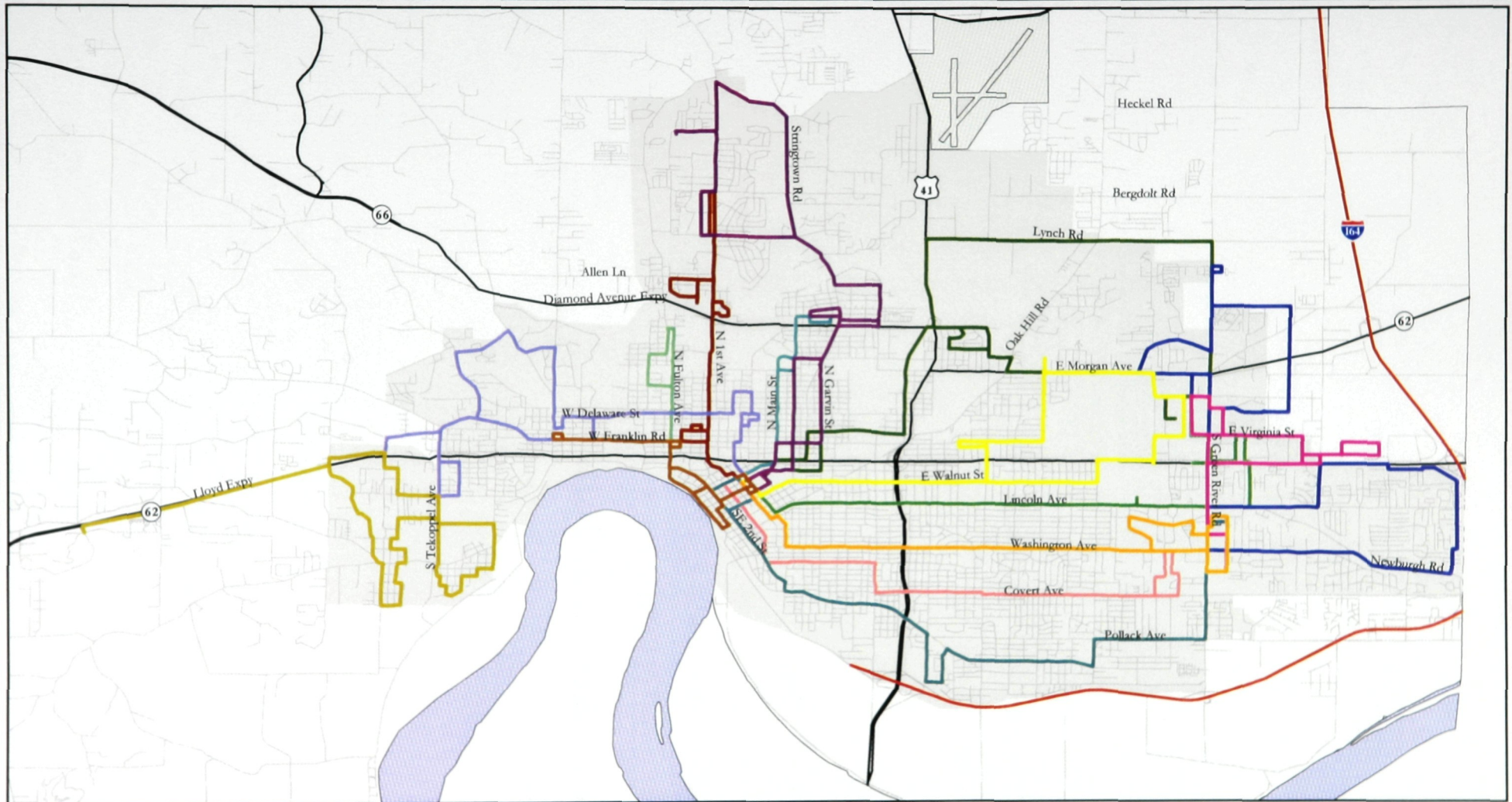
Burkhardt Road, the vacant Builder's Square building at the Lloyd Expressway and Cross Point Boulevard, the vacant K-Mart shopping center in Newburgh, the Bell Oaks shopping center in Newburgh, the vacant K-Mart facility near I-164 and Kentucky Street, the K-Mart shopping center in Mt. Vernon, the Wal-Mart shopping center on US-41 in Henderson, the Wal-Mart shopping center at US-41 and SR 64 in Princeton, the intersection of I-64 and US-41, the intersection of SR 62 and I-164, and near the intersection of I-164 and I-64. Other possible locations are shown on Figure 6. The Evansville Urban Transportation Study can use funds to develop park and ride facilities only within its study area. Any desire on behalf of neighboring counties to implement a park and ride lot would have to be initiated at the local level. The Evansville Urban Transportation Study will provide further information about park and ride opportunities to municipalities or counties that express interest.

When a lot is developed within the City of Evansville or the City of Henderson, it would be desirable to locate the lot adjacent to an existing bus route. Current Metropolitan Evansville Transit System (METS) bus routes and Henderson Area Rapid Transit (HART) bus routes are shown in Figure 12 and Figure 13, respectively. Existing and possible future bus routes in both public transport networks provide adequate access to urbanized areas. Business opportunities in the core of the city along with shopping centers, restaurants and other activities are all served by the public transit system. Providing improved access to transit users will promote park and ride facilities and provide an alternative mode of transportation for those wishing to utilize the service.

The first step in the development of park and ride in the Evansville Region is deciding on the appropriate location for the first lot and subsequent development. The data from this research indicate that approximately seven percent of employees who were surveyed currently carpool to work and an additional thirty-seven percent would be willing to give carpooling a try.



# Figure 12: Metropolitan Evansville Transit System (METS) Bus Routes



- Local Roads
- State Roads
- Interstates
- City Boundary
- Airport

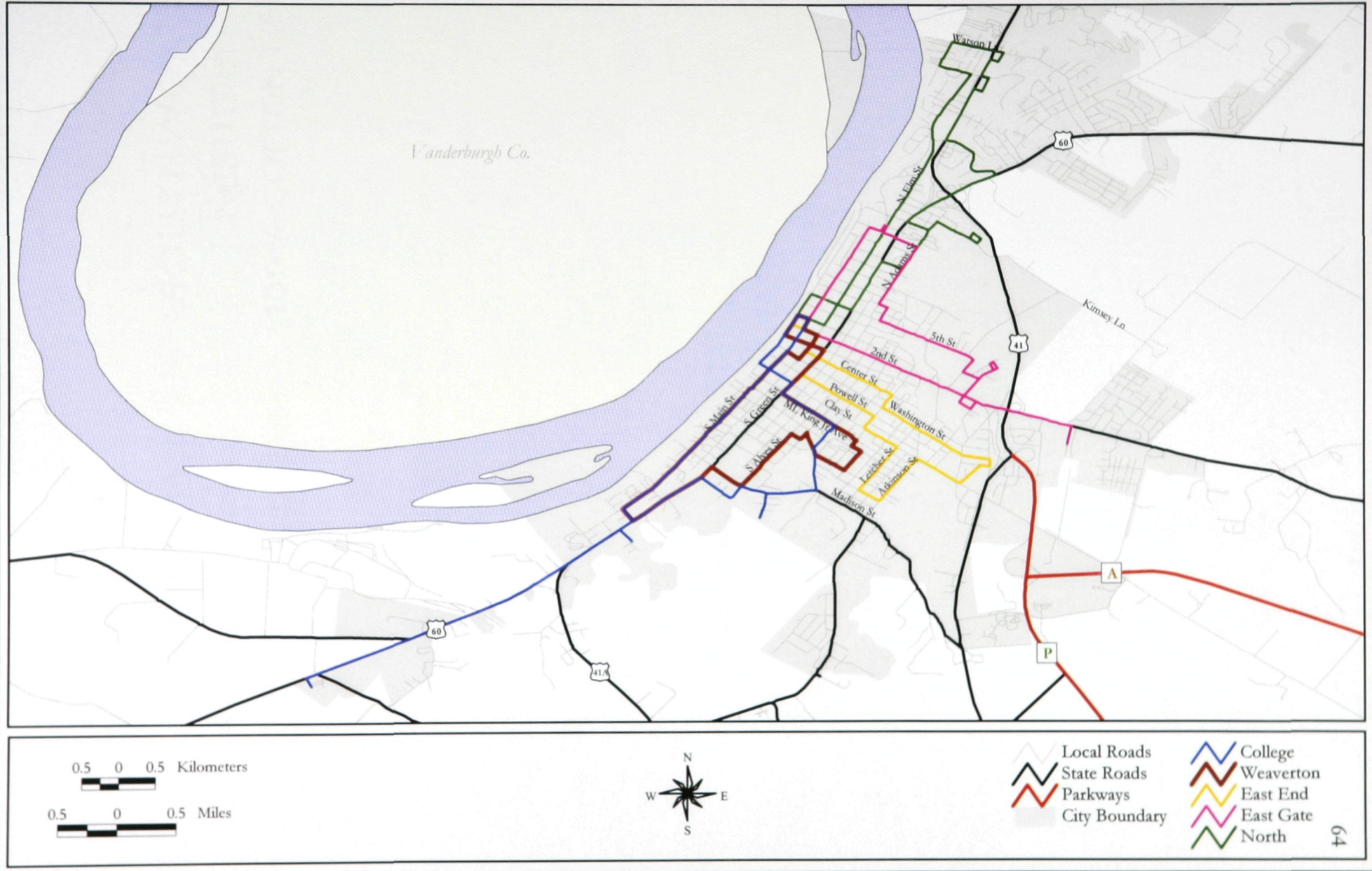
- Mary St.-Tekoppel
- Lincoln Ave.
- Fulton Ave.-North Park
- First Ave.
- Covert Ave.

- Riverside Dr.
- N. Main Trolley
- METS Connection West
- METS Connection East
- Lynch Rd.

- W. Franklin Trolley
- Washington Ave.
- Walnut-Eastland Mall
- Stringtown Rd.
- Shopper Shuttle



# Figure 13: Henderson Area Rapid Transit (HART) Bus Routes



Even if one percent of the employees who travel to Vanderburgh County, as shown in Figure 5, began to carpool due to new facilities, increased awareness, and through public campaigns, approximately 250 single occupancy vehicles could be removed from the roadways. That figure is just for one percent of the commuters traveling to work in Vanderburgh County from surrounding counties. It does not include commuters traveling from an adjacent county to another county that could also benefit from a regional park and ride facility. Also, some people within Vanderburgh County would carpool to work even though they work in the same county. The data indicate that there is a desire for carpooling among many people in this region. Knowing of their willingness, an experimental lot should be created to determine if future expansion is warranted. Using an existing parking lot would be a cheap and effective way to try out the program. The site chosen should be located adjacent to a major roadway with high visibility. The first park and ride lot selection should probably be located in the eastern portion of Vanderburgh County or western Warrick County along the Lloyd Expressway. This area serves as a major connector between the two counties.

## **FUNDING**

Congestion Mitigation and Air Quality (CMAQ) funds can be utilized to promote projects that ultimately lead to the reduction of harmful emissions in cities or counties designated as non-attainment or maintenance. With the next air quality ruling, it is anticipated that Vanderburgh County, Warrick County and Posey County in Indiana and Henderson County, Kentucky, will all be in the non-attainment category. Gibson County, Indiana should be an attainment county. Funds are distributed to states based on a formula that accounts for the population living within a non-attainment area, weighted by the severity of current air pollution

(INDOT 1994). For Fiscal Years 1998-2003, approximately \$8.122 billion is allocated for CMAQ projects nationwide and \$1.6 billion is proposed for FY 2001 (USDOT 2000).

The CMAQ project has been successful in other areas, and the programs implemented under ISTEA have been carried over to the TEA-21 program. Over the first six years of the CMAQ program, \$4.6 billion of the possible \$5.5 billion available for CMAQ projects was distributed (USDOT 2000). Approximately 43% of the allocated funds went to transit uses, and 34% were used for Intelligent Transportation System (ITS) improvements (USDOT 2000). As an example of reduction possibilities in the United States, in 1997, emission reductions for “CMAQ-funded projects were 170 tons per day for VOC and 430 tons per day for CO” (USDOT 2000, p. 4).

Projects eligible for CMAQ funds must provide quantitative documentation demonstrating reductions in VOCs, CO, NO<sub>x</sub>, and/or reduction of single occupancy vehicles (SOVs). CMAQ funds may be appropriated for any of the following use categories (INDOT 1994):

**Transit:** New and expanded services, parking for transit.

**Other Shared Ride:** Vanpool and carpool programs, parking for shared-ride services, etc.

**Highway/Road:** Traffic management and control services, construction or dedication of High Occupancy Vehicle (HOV) lanes, signalizing projects, and intersection improvements.

**Demand Management:** Employee commute option programs, transportation management plans, flexible work schedule programs, vehicle restrictions programs, etc.

**Pedestrian/Bicycle:** trails, storage facilities, etc.

**Public Education Programs:** Promotional activities that help support and market travel behavior patterns.

The use of CMAQ funds for park and ride facilities is authorized under the Other Shared Ride category, and TDM funds are also available for employer programs that support transport alternatives in the work place.

Funding for park and ride facilities would be available through Congestion Mitigation and Air Quality (CMAQ) funds if a reduction in daily emissions can be demonstrated. To determine the emission reduction factors of a park and ride facility, calculations based upon accepted formulas should be utilized. For a park and ride facility, first the number of automobiles removed daily from the roadway should be determined. This figure includes the historical or possible park and ride utilization, including informal park and ride lots, multiplied by the number of new parking spaces dedicated for the park and ride lot. This number is then inserted into the following formula to determine the daily emission reduction in kilograms per day:

$$\text{EmRed} = \text{Autos Removed} * (\text{Avg. Driving Distance} * 2) * \text{Peak Hour Speed Emission Rate of LDGVs} * \text{kg} / 1000\text{g}$$

The formula considers reduction based upon LDGVs (Light Duty Gas Vehicles) since the majority of park and ride users would be automobile drivers (FHWA 1999). Also note that the average driving distance is doubled to simulate a roundtrip.

Once emission reduction is demonstrated, an application form must be submitted by an MPO to the state level for initial approval of the application. All requests are reviewed on a competitive basis and projects receiving approval are then submitted to the FHWA, FTA, and EPA for concurrence. When approved, the MPO is contacted by the state notifying it of approval and award of funds. The CMAQ process often begins in the Fall with funds allocated in the Spring. However, CMAQ applications may be submitted at any time.

## CONCLUSIONS

Some form of park and ride feasibility should be conducted for new park and ride facilities in small- to medium-sized MPOs. Without a feasibility study, the random development of a lot will not guarantee success and can be a great waste of taxpayer money. Many residents of Danville, California, with a population of approximately 35,000, are upset that the city spent approximately \$3.2 million dollars to construct a park and ride facility adjacent to I-680 that currently serves only 20-30 vehicles per day (Davis 1999). The lot capacity was calculated anticipating possible capacity in 2020, but a feasibility study for the facility was not conducted. The lot may one day be full but, in the interim, officials can only explain the lack of use by indicating “it takes quite a while for commuters to notice something” (Davis 1999). Analyzing local data, current and proposed congestion of roadways, surveys of employees and employers and other sources can provide a foundation to make sound decisions on projects such as park and ride facility locations.

Indiana has especially been slow in the development of alternative forms of travel such as park and ride or carpooling. Many smaller MPOs within the state are facing similar congestion problems and the possibility of increased congestion in the future should be incentive enough to explore measures that will help curb the trend of single occupancy vehicle travel. Park and ride facilities might not be the answer in every community, but without properly examining the possibility the impacts of park and ride development will not be known.

Other communities might benefit more from efforts to encourage other forms of Traffic Demand Management. Companies may be willing to allow employees the freedom of compressed work weeks or flexible schedules to reduce the amount of congestion on the roadways during peak travel times. Others may be willing to implement telecommuting work environments to allow employees to work from home and travel to the office less frequently.

There are many ways that innovative programs can impact the overall air quality and congestion of our roadways. Today more than ever, cities are faced with roadway congestion that paralyzes rush hour commuters. Traffic congestion leads to a loss of productivity in the office and the loss of personal time. But many people do not understand the hidden costs of driving alone to work. The impact on the environment, the actual cost of operating a vehicle, the loss of time and efficiency, and the maintenance cost for roadway upkeep are all results of the choice to drive alone. With the possibility of increased gas prices and the increasing congestion on roadways, now is the time to promote alternative forms of commute travel. The general population must be educated about the overall cost and benefit savings that carpooling or transit use generate.

Transportation planners must reevaluate current practice to determine if such strategies are right for their community. Incorporating new components into long-range plans that encourage carpooling, transit, or bicycle and pedestrian modes of travel will ultimately help to reduce roadway congestion and further improve the air quality. Eventually trip reduction programs may become mandated instead of encouraged. In 1996, President Clinton signed a bill that “required any business employing 100 or more people in areas designated ‘severe or extreme ozone non-attainment areas’ to reduce the number of employee trips to and from work by 25 percent” (Prenon 1996, p. 4). It is very likely that future Clean Air standards will require implementation of such programs. Encouraging proactive planning now is the perfect opportunity to prepare for the future. A proactive approach to continued traffic congestion is the only way to improve the quality of life standards that are vitally important to the growth and prosperity of a city.

Part of a successful proactive planning approach is the collection and analysis of current trends within any community. The same steps completed for this park and ride analysis could be

applied to any community large or small. Some adaptations may be necessary, but the basic research foundation should provide good insight to current commuting trends within a community. In a more progressive-minded community, it could be anticipated that employees and employers will be more involved in the process by completing forms and providing the necessary information. The fact that Evansville is not known as a progressive-minded community may also diminish the benefits of park and ride facilities, although the data presented in this paper demonstrate that there is an air quality problem in the region.

Americans are in love with cars and who can blame them? Automobiles give one the freedom to go wherever and whenever one wants. However, when roadways become so congested that travel time is significantly increased, people may begin to explore alternative modes of travel. It might take another fuel shortage or possible mandates based upon poor air quality status to convince motorists that there are more efficient ways to travel. Local government regulations that limit development outside of designated growth areas to maintain a compact city may also be necessary.

Examples such as Portland, Oregon, demonstrate that implementing strict zoning regulations do work. They may be unpopular to developers who are used to developing large tracts of land for sale while contributing to the problem of sprawl, but planners need to keep the community as a whole in mind. It is better to plan ways to reduce congestion, air pollution, and sprawl, or is it better to rely on the concept that any development is good development? It is a tough question but one that planners must face. We as planners should be looking ahead for ways to meet the current needs of the community, while developing a sustainable environment that can be maintained for generations to come. When uncontrolled development is permitted, damage may be done that can negatively impact future generations. If a substandard development exists, do not permit new developments to incorporate the same faults. It is



necessary that planners learn from what other communities are doing. Communities must learn from past mistakes and study future trends to determine what is best overall for the community while maintaining the regional, national, and global perspective.

Although public perception may indicate that a park and ride system is unnecessary or futile, it will more than likely be a travel demand management used at some point in the future. The region is growing, air quality is poor, and roadway congestion is currently a concern. However, Evansville is a classical midwestern city. The automobile is the main mode of travel, and other methods are viewed as inadequate or not needed. The progressive planning perception is typically not the same in the Midwest as in the Northwest or Northeast. Through social engineering, the public needs to be educated on the overall benefits of a park and ride or carpool network. Implementation in the region will provide necessary information to other midwestern cities looking to combat rising roadway congestion and air quality problems. The Evansville region is not an isolated area. The steps taken in the region will provide insight to future planning techniques in other similar communities. The region can choose whether to take an innovative approach to the problems of sprawl, congestion, and air quality as did Curitiba or Portland, or whether to maintain current practice until reactive planning strategies become necessary—plans that only mask the problem, rather than correct it.

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